

# *INNOVATIVE BIDDING* **TOOLKIT**

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**ECMS**

**ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM**

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PENNDOT  
Highway Administration  
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## PROJECT GUIDANCE MATRIX FOR INNOVATIVE BIDDING PRACTICES

NOTE: This matrix is only a tool to guide in selecting projects that may be good candidates for innovative bidding type provisions.

Project Criteria	"Place X if "Project Criteria" statement applies to project being evaluated."	Design/Build Modified Turnkey	Incentive/Disincentive for Early Completion	A+Bx Bidding	Lane Rental	Design/Build Request for Proposal	Warranties	Lump Sum
Emergency Project		X	X			X		
Minimize construction time		X	X	X	X			
Must complete project by a specific date			X					
Possible conflict between construction and a major public event			X	X				
Significant construction impact to local businesses			X	X	X			
Lengthly detours/significant delays			X	X	X			
Detours impractical but lane and/or shoulder closures required					X			
High traffic volume roads/high road-user-costs (RUC)			X	X	X			
"High RUC and public desire to complete project early, along with history of similar projects for accurate estimate of contract time"			X	X	X			
"High RUC and public desire to complete project early, but no history of similar projects for accurate estimate of contract time"			X	X	X			
Low RUC but need to expedite construction			X	X	X			
Safety issues related to construction			X	X	X			
Multiple bidders anticipated				X				
Low number of bidders anticipated			X		X			
Major objective is to reduce total project duration (design & construction)		X				X		
Major objective is to reduce design procurement time		X						
Major objective is to guarantee quality of specific items							X	
Well defined project with common work items								X

### KEY:

RUC = Road User Costs

# SECTION I OVERVIEW

## ■ A. Introduction

In the face of a strengthening trend over the past decade that has seen typical transportation improvement projects in the United States take longer to complete and cost more, agencies and contractors have begun looking for alternative methods for contracting highway construction projects. To meet the safety, convenience, and economic needs of the traveling public, a change in the contracting process had to emerge, a change that would provide for the consideration of quality, time, and other value-adding factors during the contract bidding process. Numerous PENNDOT Customer Surveys have indicated that opportunities do exist for the Department to improve contracting procedures to meet increasing customer expectations for reduced construction congestion and improvements in project quality.

Pennsylvania and many other states have laws that stipulate the selection of a contractor must be based on the lowest bid, which is a system that primarily factors a contractor's expenses and profits into the bid, but leaves very little room for the Department or the contractor to consider social costs such as disturbance to the traveling public. By identifying particular performance measures as well as low cost in the contract bidding process, factors that affect both social and economic costs can be stipulated and accounted for within the contract agreement. This then, becomes a way to incorporate those social costs into a contract that still stays within the low-bid mandate. Innovative bidding provides opportunities for the contractor to realize greater financial benefit by satisfying those social stipulations.

***"As the user demand on the nation's roadways increases so do the age and deterioration of the structures. Highway construction and repairs involve high-cost contracts that require large amounts of time to complete. In addition to the direct construction cost, there are indirect costs such as traffic delays, loss of business by those located off the construction zone, increased safety risk to the user, and increased gasoline consumption. While the direct construction costs are based on materials, manpower, equipment used, and specific condition of construction site, the indirect costs are affected by the length of the contract period and the extend of disruption of travel. By reducing the overall project completion time, the indirect costs will also be reduced."***

- Majid Jaraiedi, Ralph W. Plummer, Mary S. Aber, "Incentive Disincentive Guidelines for Highway Construction Contracts," Journal of Construction Engineering and Management, 121 (March 1995):112

The Transportation Research Board's Task Force on Innovative Contracting (A2T51) produced Transportation Research Circular 386: "Innovative Contracting Practices" in 1991. The FHWA also established the Special Experiment Project No. 14 (SEP-14) Innovative Contracting, which allows various contracting methods to be employed on Federal-aid projects, such as Cost + Time bidding (or A+Bx), Lane Rental, Warranties, and Design-Build. In 1995, FHWA moved A+Bxx, Lane Rentals, and Warranties from an experimental classification to general, approved use by DOTs, while Design-Build still requires specific approval by the FHWA Division Administrator.

PENNDOT's implementation of these efforts is an attempt to enhance the existing partnership between the Department and the contractor community, and allow those contractors to realize a reasonable profit, while, at the same time, extend a reasonable effort into minimizing social-cost items. Building incentives into the contract language provides motivation to meet the other parameters, enhancing the traditional bidding paradigm where only

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cost and responsiveness are taken into account by the contractor. Incentive awards, however, should always be considered in the planning/budgeting process since payment of these awards may be significant enough to impact the affordability of future projects' cash flow in a given time period.

In a typical case where a construction project in a city's business district will affect local business profits, the project owner should be well aware of these losses, and try, to the greatest extent possible, to minimize them in establishing the project schedule. In a traditional contract that meant establishing a reasonable completion date for the project. In an innovative contract, real dollar incentives might be used to account for the time factor into the contract cost.

The contractors' bid proposals on the project would then bear in mind the project completion time in a similar manner as the owner and the local businesses might, and associate a real dollar value on social as well as contract costs. The performance of the contractor in meeting those stipulations will have a direct bearing on their real profit (or loss) as incentives or disincentives are brought to bear as the project progresses. Those incentives can be placed on individual project milestones, quality factors, or overall completion date.

To achieve these improved contracting results it is often appropriate to use more than one innovative bidding technique on a particular project. Innovative bidding techniques, moreover, are most successful on projects where time and/or quality is a critical concern and should not be used routinely on every project. The overuse of innovative bidding techniques may tend to diminish their effectiveness.

## **Innovative Biddings Methods Identified in the BPR Report**

### **Time-based**

Design-Build Modified Turnkey\*  
A + Bx Bidding \*  
Lane Rental \*  
Incentive/Disincentive \*

### **Quality-based**

Design-Build Request for Proposal (RFP) \*  
Warranties \*

### **Other**

Lump Sum \*  
Price/Qualification Based  
Multi Parameter A+Bx+Q  
No Excuse Bonuses  
Job Order Contracting/Indefinite Quantity  
Liquidated Savings  
Low Bid  
Liquidated Damages  
Systems Manager  
Bid Averaging

\* These methods were carried forward for further evaluation by the Department.

Check the Appendix for more definition of the other techniques.

## **B. PENNDOT, ECMS and Innovative Bidding**

The Department has initiated work on the development of policies, procedures and presentation materials to implement innovative bidding techniques and educate the Department on their applicability and benefits. The Business Process Re-engineering (BPR) Report on Innovative Bidding (issued March 17, 1998) recommended, among other things, the development of this toolkit to help build a common understanding of the bidding methods for 15 specific innovative bidding techniques, all of which are mentioned below. The BPR Report also recommended the continued analysis, education and pilot implementation of selected innovative bidding techniques and the communication of the Department's direction on innovative bidding to both the design/construction industry and PENNDOT personnel.

To that end, the Bureau of Construction and Materials has since identified six of the 15 techniques that should be evaluated in further detail for future application by the Department. These six techniques include Design-Build, Lane Rental, A+Bx, Incentive/Disincentive for Early Completion, Warranties and Lump Sum. This toolkit includes the definition and purpose, benefits, project selection criteria, potential risk analysis and possible application for each of these techniques within the Commonwealth, and the changes needed in the Department's current bidding process.

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Work has been initiated to address the recommendations for these six techniques through the development of awareness sessions/education workshops for the design and construction communities, the development of this innovative bidding practices toolkit, and the identification of any necessary changes to policies, procedures and/or regulations to implement these techniques, and presentations to PENNDOT personnel.

### **Using CPM Scheduling**

All these techniques being evaluated will require the Department to complete a detailed and specific bidding package, including a reasonable construction schedule. PENNDOT has adopted the critical path method (CPM) of project management as a tool for formulating that schedule. Building this schedule begins in a series of pre-bid meetings with relevant Department personnel in which project tasks are specified with their interrelationships and estimated durations. CPM can be a valuable tool for developing and monitoring the project's schedule by graphically portraying what tasks must be performed in sequence and concurrently, and for making adjustments in the schedule for unforeseen delays. CPM scheduling has also proven to be valuable in claim situations to verify the actual effects of specific events.

### **Determining Road User Costs(RUC)**

Road user costs are the basis for determining the penalties and/or incentive amounts to be used in

### **Reasons for Using Innovative Bidding**

An analysis performed by the ECMS process team as part of the BPR Report concluded that implementing innovative bidding practices will:

- Result in more projects being completed on time, within budget and to high quality standards
- Result in well-clustered competitive, balanced bids
- Ensure a fair profit can be realized by the successful bidder
- Be defensible in court
- Maintain compliance to regulations or change regulations when necessary
- Ensure there is a minimum amount of discretion used when determining successful bidders
- Result in no contracts being awarded to contractors who can not perform the work
- Provide enough time for contractor and Department personnel to prepare bids

contracts involving innovative bidding techniques. Road user costs place a value on the delay time (vehicles-hour/day) and other additional costs expected from roadway construction. Road user costs include additional travel time or delay due to reduced speeds through work zones, additional fuel cost due to reduced speeds through work zones and delays, additional delay and fuel cost if a detour is used on a project and projected increases in the crash rates in work zones or the additional number of crashes due to the additional vehicle miles of travel on a detour. Road user costs may also include winter shut down cost, maintenance of traffic cost on the project and/or project detour cost and additional cost due to delays in opening adjacent projects or subsequent phases. The road user costs are estimated based on the above information and with consideration of the project's road classification, traffic volume data and traffic control plans. The road user cost are expressed in a monetary value by applying a "value to time" ("\$/vehicle-hour" or "\$/person-hour") to the above information.

Resources that can be used to calculate road user costs are identified in Design Manual 1A.10.5J. There are several methodologies identified and it is noted that any calculations used to develop road user costs should provide reliable percentage of truck traffic in the cost computations; reflect assumptions about real time elements; spell out all assumptions clearly; and be as simplified as possible.

The six innovative bidding techniques being evaluated by the Department are categorized into three groups: Time-based, Quality-based, and Others.



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## C. Time-Based Methods

Time-based innovative bidding methods make use of contract provisions specifically designed to reduce the time of construction and to ensure on-time project completion. Depending on the specific requirements of a project, certain objectives are emphasized and the contractor is expected to take the necessary action to realize them.

Emergency projects, just because of the need to resolve the emergency situation quickly, lend themselves well to time-based innovative bidding techniques. While the low-bid mandate still applies even in the face of an emergency, the use of incentives on total time as well as specific milestones can be a very effective means of bringing the problem to a quick and acceptable resolution. Emergency projects are discussed in Design Manual 1.5.3F.

**Design-Build** is the process by which a single entity bids to provide both the design and construction under a single contract between the Department and the design-build contractor. The **Design-Build Modified Turnkey** method allows the Department to perform most of the up-front design work such as environmental clearance, line and grade/sections, conceptual designs, and right-of-way determination and acquisition. The contractor is then responsible for completing the design and construction based on the information received from the Department.

The **A + Bx** method involves time with its associated cost in the low-bid determination, where “A” is the traditional bid for contract items such as equipment, material and manpower, while “Bx” is the time element reflecting the total time required to complete the project in calendar days as estimated by the bidder times the estimated cost to the traveling public (RUC).

The **Lane Rental** method contains a contract provision that states the contractor will be charged for time it occupies a lane that affects the traveling public, and may stipulate the days and hours the contractor is allowed to occupy the roadway’s travel lanes.

**Incentive/Disincentive for Early Completion** provisions may be used by the Department to reward a contractor for reaching major project milestones ahead of schedule or for shortening the overall project construction time. Disincentive clauses work to motivate the contractor to complete the project on or ahead of time, within accepted specifications.

## D. Quality-Based Methods

AASHTO defines quality assurance as “all those planned and systematic actions necessary to provide adequate confidence that a product will satisfy given requirements for quality.” As part of an innovative bidding process, that assurance can be stipulated in the contract to guarantee that specified quality standards are being met.

In **Design-Build Request For Proposal (RFP)** contracting, one entity (often a general contractor using a licensed architect or engineer as a subcontractor) assumes total responsibility for the project, from design through construction. The (RFP) process involves the Department providing general technical criteria, to which each bidding contractor responds with a separately sealed technical proposal and price proposal.

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**Warranties** provide an alternative for the Department to delegate quality control to the contractor, because with their use, the contractor guarantees the integrity of a product and assumes the responsibility for the repair and replacement of deficiencies.

## E. Other Methods

The **Lump-Sum** method, as an alternative to Time or Quality-based methods, provides the bidding contractor with a set of bid documents and the contractor is then required to calculate quantities and develop a lump sum bid for all the required work.

## F. Coordination Between Design and Construction

In any innovative bidding scenario, prior to bidding, agency personnel from the relevant Design and Construction sections meet to evaluate proposed project design and develop a feasible construction schedule. These meetings, called **Constructability Reviews**, should also be used to investigate the known project details and seek out any flaws in the contract as proposed to that point that may prevent the project from going forward. It is important at this point to begin to identify any potential utility, right-of-way, environmental and cultural issues. Potential third-party issues should be identified and steps taken to diminish any conflicts. These reviews are strongly suggested to insure the best results for all innovative contracting techniques. Also, meetings between the Design and Construction staff should be held to discuss key items in the contract, such as scheduling, time overruns, calendar day definitions, and incentive/disincentive stipulations to ensure that these special provisions are understood, well defined and communicated to the bidding contractors.

It is also important at this time to make a determination of the possible risks associated with the use of any innovative bidding technique. The design and construction personnel should jointly address the identification of those items that are within the Department's control and those items that are not under the Department's control. The identification of these factors will help to address the question of the worse thing that could happen by using a particular innovative bidding techniques; what are the benefits to the Department and our customers if everything goes according to plan; and, what are the risks or costs if some things do not go according to plan. The identification and discussion of these risk issues during the constructability review by both design and construction personnel will determine, to a great extent, the success or failure of using innovating bidding techniques.

## G. Additional Research Effort

The Department should evaluate the merits of expanding the current limited use of warranties and lump sum contracts. The use of warranties by the Department has been limited to specific work items such as line painting, pavement markers and bituminous paving. There are distinct advantages to these two types of innovative bidding techniques such as reduced inspection and testing, improved project performance and reduced contract administration costs.

## SECTION II SUMMARY OF INNOVATIVE BIDDING PRACTICES

### ■ General Considerations

#### *Prequalification Requirements*

The Department's standard contractor pre-qualification requirements apply to each contractor based on the applicable categories for the specific project. Each prime contractor must be pre-qualified in accordance with 67 PA Code Chapter 457 (Regulations Governing Prequalification of Prospective Bidders) prior to the let date or the submittal date of the technical proposal, and must be prequalified to perform a minimum of 50 percent of the construction portion of the contract.

#### *Public Announcement Process*

The Department will follow its standard advertisement process for acquiring professional services, as well as advertise in local newspapers and trade publications. The advertisements should be published a minimum of eight weeks in advance of the proposal due date (and a minimum of 12 weeks for Design-Build Request for Proposal (RFP) type projects). The advertisement shall state a general description of the work and will include the general requirements as stated above, any additional technical qualifications desired, and the time frames for submitting the bid proposals. In order to take full advantage of the process, each project advertisement should be drafted to fit the unique needs of that particular project.

For RFP type projects, the evaluation criteria for the technical proposal should be included in the advertisement. An approximate cost range (inclusive of both design and construction) for the project should be given in the advertisement.

#### *Quality Assurance*

The Department is responsible for ensuring that design, materials and workmanship incorporated into each Federal-aid highway project on the National Highway System are in conformity with PENNDOT requirements. PENNDOT inspection, testing and acceptance requirements are the same as conventional projects unless otherwise stipulated in the contract. Appropriate quality control plan requirements for the contractor should be included in the scope of work.

The "Glossary of Highway Quality Assurance Terms" can be found on the web at:  
[www.nas.edu/trb/publications/ec010/ec010.pdf](http://www.nas.edu/trb/publications/ec010/ec010.pdf)

"Quality Assurance Procedures for Highway Construction" can be found at:  
[www4.law.cornell.edu/cfr/23p637.htm](http://www4.law.cornell.edu/cfr/23p637.htm)

The fundamental Quality Assurance Requirements are defined in the "Glossary of Highway Quality Assurance Terms," a July 1999 update of Transportation Research Circular #457, which covers specifications, materials and workmanship; the "Implementation Manual for Quality Assurance," February 1996 by the AASHTO Highway Subcommittee on Construction, which primarily covers materials; and Quality Assurance Procedures for Highway Construction, 23 CFR Part 637, which covers materials and workmanship. These criteria require at least three independent roles, including quality control by the contractor, acceptance or verification by the agency field office, and independent assurance by the agency central staff. The responsibilities for

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all three roles and minimum sampling, testing and inspection frequencies must be described in the scope of work. If any of the three roles is eliminated, project quality shall be closely monitored and an objective analysis shall be made of the impact of the change on the quality of the project.

#### *Warranty Requirements*

Warranty requirements offer the potential for improved project performance, contractor flexibility and reduced inspection and testing. When warranties are used on the NHS they must comply with 23 CFR 635.413, which specifies that warranty requirements must be approved in advance of PS&E by FHWA and that no warranty requirement may place an undue obligation on the contractor for items over which the contractor has no control. Warranty requirements may substantially change contractor and Department Quality Assurance roles that should be addressed in the scope of work.

#### *Procurement of Services*

The Department's standard procurement procedure is the low bid method of selection. In the innovative bidding techniques, however, the bid proposals are modified to reflect the social and economic costs through the use of such factors as Road User Costs and/or Technical Review Committee to evaluate proposals.

#### *Scope of Work*

The scope of work represents the Department's essential project expectations, and its purpose is to provide sufficient information upon which contractors can prepare bid proposals. The scope of work package developed by the Department will include the construction engineering requirements, the construction services required and the Department's responsibilities.

For those projects requiring design services the scope of work package will include the above plus specific design requirements for the project. In particular, the scope of work should identify the information to be furnished by the Department and design activities to be accomplished by the successful bidder. See Section III Other Considerations under D/B MTK and RFP for more details on the Scope of Work.

## **Time-Based Methods**

### **Design/Build Modified Turnkey**

#### *Purpose*

Design/Build is a project delivery method in which the owner executes a single contract with one entity to provide both engineering and construction services instead of the traditional design/bid/build system. A Modified Turnkey Design/Build project is one in which the owner/Department establishes the preliminary engineering information and the Design/Build team completes the design and constructs the project based on the information provided. It is considered more cost-effective than traditional methods because the design is developed by the contractor and reflects the contractor's individual mode of operations and not the Department's perception of cost-effective design.

More information on Design/Build initiatives can be found at the web site of the Design-Build Institute of America at: [www.dbia.org](http://www.dbia.org).

A Modified Turnkey project is developed in three phases: 1) preparation of PENNDOT's partial design package and project advertisement; 2) selection of the Design/Build contractor via lowest responsiveness and responsible bidder proposal; and 3) project completion including design and construction. PENNDOT's responsibilities in a Modified Turnkey process include:

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defining work limits, specifying line and grade sections, providing the conceptual design, obtaining all permits, securing environmental clearances, arranging for utility relocations and right-of-way acquisitions. The bidder must complete the design based on the information provided by the Department and must include a design consultant on the team to prepare a conceptual design for bidding purposes.

#### *Benefits/Risks*

The goal of Modified Turnkey projects is to secure more cost effective projects with shorter project durations. In theory, the main benefit is derived from a shorter time for project completion at a lower cost. The time saving is realized because the construction can start before the final design is completed, and involving the contractor in the design process should lead to less change orders. In a Modified Turnkey process, the Department also maintains more control over the initial design specifications of the project while still benefiting from the shorter completion time. There may be a risk of incurring a higher cost to develop a bid.

In traditional development processes, design specialists closed the books on the project after it was let to Construction and moved on to the next project. But Modified Turnkey allows the contract to be let to Construction before final designs are completed, meaning a potential risk could occur if the responsible designers are not available for design review as the project progresses. The Department's design and construction units must both make the commitment to coordinate work activities with the contractor and his designer to insure timely review of all submissions including any proposed changes to both the design and construction schedules.

#### *Typical Project Profiles*

Modified Turnkey can be applied to any type of highway or bridge construction project, but especially those that are non-controversial in nature and have a well-defined scope of work, or emergency projects.

#### *Other Considerations*

Modified Turnkey proposals are rated by the owner on factors such as design quantities, timeliness, management capability and cost. This method provides a great deal of flexibility for innovation in design but it also places a greater responsibility on the contractor. The Design/Build method can be combined with other innovative bidding methods such as warranties or incentive/disincentive. It is also reasonable to look in to this method at various points in the design process.

For more information on Innovative Bidding best practices, visit the FHWA web site at: [www.fhwa.dot.gov/quality/Category\\_4.htm](http://www.fhwa.dot.gov/quality/Category_4.htm)

The design must be completed by a registered professional engineer and construction must be completed by a pre-qualified contractor. All consultants and subconsultants must have a current annual qualification package on file with the Bureau of Design's Consultant Agreement Division and District Office.

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## A+Bx Bidding

### *Purpose*

The A+Bx bidding method is a variation on the low bid method of awarding contracts. This method places a monetary value on the time component of a contract and adds it to the bid amount. The contract is then awarded to the bidder with the lowest combined value.

The cost plus time formula (A+Bx) involves time with an associated cost, where “A” is the traditional bid for the contract items such as equipment, materials and manpower, and “B” is the time component that reflects the total time required to complete the project, as estimated by the bidder. To ensure uniformity of time charges, only calendar days should be used by the contractor to estimate construction time. The “B” time component reflects road user costs “x,” which can be defined as the estimated daily cost of inconvenience to the traveling public resulting from the roadway construction. Inconvenience is defined in terms of lost time.

Road user costs (RUC), expressed in the unit “\$/day,” can be determined through a road user cost Study conducted at the time of preparing the bid proposal. In this study, the delay time (vehicle-hours/day) expected from roadway construction is estimated based on traffic volume data and the traffic control plans. It is then converted into a monetary value by applying a “value to time” (“\$/vehicle-hour” or “\$/person-hour”). The value of lost time varies but generally includes the costs of people’s time, vehicle operation, accident and traffic violation, etc.

### *Benefits/Risks*

The primary benefit to be gained with A+Bx bidding is placing a value on the inconvenience to the traveling public by rewarding the contractor for directing the project on a tight schedule and actively looking for time saving.

The risks of A+Bx bidding include a contractor potentially being awarded the job only to find they can’t meet their own schedule. It is strongly recommended to always include Incentive/Disincentive provisions with A+Bx to avoid this situation.

### *Typical Project Profiles*

A+Bx bidding is most effective on projects where there is a real need to shorten the duration of impacts to high-traffic areas such as business or tourist areas. It might also be appropriate where the detour may impact an environmentally sensitive area or where the construction causes increased safety concerns, such as a heavily traveled highway. A+Bx bidding is ideal for simple bridge replacement projects.

### *Other Considerations*

Always consider combining this bidding method with Incentive/Disincentive provisions to discourage the contractor from running over the time bid for the project. Those provisions should make use of the same road user costs established earlier as the basis for determining incentive values. For instance, if the contractor finishes the work earlier than the bid time, the incentive should be calculated from the number of days earlier than the bid completion date multiplied by the road user costs. Likewise, late finishes should be penalized using the same calculation.

For the most effective use of A+Bx bidding, there are several considerations that should be factored into the planning process. Make sure the scope of work is thoroughly defined and

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potential delays to start of work are avoided. Verify that there are no major railroad or utility related issues that are beyond PENNDOT's control. Ensure that there is adequate inspection of the work and administration of the contract. And make sure that right-of-way issues are resolved before contract bidding. In short, verify that all reasonably foreseeable potential work delays are accounted for prior to starting the bidding process. A+Bx contracts are also ideal for making use of critical path management (CPM) schedules for monitoring progress and resolving impacts from contract changes.

## **Lane Rental**

### *Purpose*

The Lane Rental method, like A+Bx, places a real value on the amount of time a lane or shoulder will be unavailable to the traveling public while the project is under construction. This method rents the lane to the contractor for the time needed to construct the project. In the bid the contractor estimates the amount of time needed: if that time is not used up the contractor doesn't pay the rental fee for additional days, but if the contractor runs over the time the fee is applied to the additional days.

The lane rental fee is based on estimated cost of delay or inconvenience to the road user during the rental period, again like the A+Bx method, using the RUC. The fee is assessed for the time that the contractor occupies or obstructs part of the roadway and is deducted from the monthly progress payments. The rental fee rates are stated in the bidding proposal in dollars per lane per time period, which could be daily, hourly or fractions of an hour. Neither the contractor nor the Department give an indication as to the anticipated amount of time for which the assessment will apply and the low bid is determined solely on the lowest amount bid for the contract items.

### *Benefits/Risks*

The main benefit of Lane Rental is realized by providing the contractor with incentive to get in and out of the lane quickly in order to minimize the inconvenience to the traveling public. A possible risk associated with lane rental is the failure to properly define key terms in the bid package, such as "lane closure" or "opening," as discussed under Other Considerations in this section.

### *Typical Project Profiles*

Projects appropriate for Lane Rental include those projects where work can be restricted to one lane at a time. It is well suited for multiple lane roads with high traffic volumes or where alternate routes/detours are not available or are impractical. It also can be used in politically sensitive areas or projects with high profiles, or major roadways, bridges or interchanges with high ADT.

### *Other Considerations*

Lane Rental can be combined with other innovative bidding methods such as Incentive/Disincentive to achieve a timely finish to the project and maximize the contractor's profits while minimizing road user disturbance. It is strongly recommended projects where Lane Rental bidding is used, the project should be free of third-party conflicts (i.e., utility or right-of-way issues).



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It is crucial that the lane rental fees are determined accurately for specific sequences during construction phases. The contractor must be able to benefit sufficiently to encourage interest, stimulate innovative ideas and increase profitability by meeting tight schedules. It is also important to verify that rental amounts also include construction engineering inspection and costs for maintenance and protection of traffic.

Also ensure that definitions for “lane” and “closure” are spelled out in detail in the bid package. Is a shoulder considered a travel lane? Must the lane(s) be open 24x7? Are partial closures allowed? Are overnight closures allowed? Finally, ensure that there has been sufficient precontract investigation of the pavement, soil, drainage, bridges, etc., to avoid potential delays once construction starts.

## Incentive/Disincentive for Early Completion

### *Purpose*

**Incentive/disincentive** (I/D) clauses enforce provisions for time and emphasize the project’s objectives: cost, schedule, and performance. The contractor is rewarded with bonuses as incentive for early finishes and penalized with charges for late finishes. Depending on the specific requirements of a project, certain objectives are emphasized and the contractor is expected to take the necessary action to realize them to qualify for incentive payments. Disincentive clauses are not the same as liquidated damages: disincentive clauses are generally much larger in amount and work to motivate the contractor to complete the project on or ahead of time, within accepted specifications.

For more detailed analysis on the use of Incentives/Disincentives in the bidding process, see the FHWA Technical Advisory T-5080.10, Incentive/Disincentive for Early Completion at [www.fhwa.dot.gov/legsregs/directives/techadv/t508010.htm](http://www.fhwa.dot.gov/legsregs/directives/techadv/t508010.htm)

### *Benefits/Risks*

Benefits of the use of I/D for Early Completion is that giving the contractor a financial incentive helps ensure that the project or milestones are completed on or ahead of schedule, minimizing the impact to the environment, traveling public and area businesses.

### *Typical Project Profiles*

Generally, I/D provisions should be limited to those projects where construction would severely disrupt highway traffic or highway services, significantly increase road users’ costs, have a significant impact on adjacent neighborhoods or businesses, or close a gap thereby providing a major improvement in the highway system. The project should be such that the I/D phase(s) can be completed in one construction season or less.

## **Consider the following to increase the potential success of I/D provisions.**

- Recognize that the purpose of I/D clauses is to minimize traffic inconvenience and delays.
- Do not rush to bid opening with an incomplete PS&E.
- Provide a realistic project construction schedule.
- Prepare a CPM pre-bid analysis of constructability and a realistic sequence of construction activities.
- Use the CPM schedule to monitor progress and resolve conflicts.
- Place upper limits on financial incentives and use an unlimited disincentive amount.



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Projects with these characteristics are appropriate for I/D provisions: high-traffic volumes generally found in urban areas; work that will complete a gap in the highway system; major reconstruction or rehabilitation on an existing facility that will severely disrupt traffic; major bridges out of service; and lengthy detours.

#### *Other Considerations*

I/D provisions motivate the contractor to complete projects or portions of projects on or ahead of schedule.

## **Quality-Based Methods**

### **Design/Build-Request for Proposal.**

#### *Purpose*

Design/Build is a project delivery method in which the owner executes a single contract with one entity to provide both engineering and construction services instead of the traditional design/bid/build system. In the Request for Proposal (RFP) process the Department provides general technical criteria, to which each D/B team responds with a separately sealed technical proposal and price proposal. Among the items found in a typical RFP are project design criteria, program requirements, performance specifications, site information, contract requirements, selection procedures and proposal requirements (deliverables).

#### *Benefits/Risks*

The goal of using this practice is to reduce overall time from design start to completion of the project, which provides for a shorter project completion time at a lower cost. The RFP type of procurement also provides the Department with the potential for multiple design solutions and innovation in the use of materials and systems.

The RFP process often makes it necessary for the bidders to complete a conceptual and schematic design to arrive at accurate cost estimates and address aesthetic and functional selection criteria before responding to a Design/Build RFP. This is costly and time consuming for the bidders but it transfers those costs from the Department to willing contractors. However, if the costs are too onerous free entry into the bidding competition might be lost.

#### *Typical Project Profiles*

In general, the RFP process should only be considered when projects exceed a \$25 million threshold (ITS projects may have a lower threshold), unless the project is substantially complex, and multiple design solutions and creativity are desired by the Department.

#### *Other Considerations*

In order to ensure that an adequate number of qualified bidders compete for the project and to help them cover their cost of producing the bid, consider paying a nominal fee to each bidding contractor.

## **Warranties**

#### *Purpose*

Warranties state that the contractor guarantees the integrity of a product and assumes the responsibility for the repair and replacement of any deficiencies. This stipulation, in theory, will produce better quality products, resulting in reduced maintenance costs.

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Highway construction warranties are generally for a specific product or work item. They generally provide for a two- to five-year warranty period and are only for items over which the contractor has full control. Long-term maintenance is not normally included.

#### *Benefits/Risks*

Warranties lower the Department's risk by providing assurance that the contractor will correct early failures due to poor materials or workmanship that may have gone unnoticed during construction. This eliminates or reduces unnecessary costs of early maintenance due to poor performance. Warranties also induce a higher concern for quality by contractors, designers and suppliers, and encourage the development of better testing equipment and techniques and reduce inspection and contract administration responsibilities for the Department.

Used in combination with performance-related specifications, warranties provide the contractor with the incentive to pursue more innovative technologies and methods for highway projects. Warranties may be used if the design, contract administration, or inspection capabilities of the owner are inadequate for a specific project. Warranties, with improved contracting procedures for design and construction, are expected to lead to fewer contract disputes and reduced long-term litigation.

Warranties are only as good as the contractor and the surety company involved. Will the contractor stay in business for the length of the warranty period and will the surety honor the warranty if problems arise? It is still uncertain whether surety companies will provide the long-term bonding guarantees required for warranties on large projects. Much higher risk is involved for sureties. And small or minority contractors may be eliminated from the bidding process because of the difficulty in acquiring bonding or proof of financial responsibility that results from the high-risk climate of long-term warranties.

The premature use of warranties without adequate technology or processes to handle the contracts may lead to an increase in disputes and litigation. The impacts of warranties on initial and total life-cycle costs of facilities may negate any maintenance savings: the length of the warranty period required for catching deficiencies caused by poor material or construction is of particular concern.

#### *Typical Project Profiles*

Warranty provisions are most appropriate where quality standards to be met are easily identifiable and quantifiable. This might include hot-mix asphalt and asphalt rehabilitation projects, or high-volume-restricted access (interstate, toll roads) or on bridges (decks, painting, expansion dams). This should also include work that has historically required repair within a few years of completion.

Warranties may not be appropriate for urban projects because of excessive impacts by other parties.

#### *Other Considerations*

Contract specifications must clearly define quality measurement techniques or failure thresholds to be used and the project must have well-defined limitations on work phasing. The contractor must be able to provide design input and should be able to choose the

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optimal design. Aspects of the design, or other factors not under the contractor's control, will have minimal impacts on the warranted work during the warranty period or can be distinguished from the warranted work. Sureties should be available to offer long-term warranty bonds to a sufficient number of qualified bidders.

## **Other Methods**

### **Lump Sum**

#### *Purpose*

Lump Sum bidding requires the contractor to develop the quantities from the contract package prepared by the Department then submit a Lump Sum bid for the project as opposed to an estimate that lists individual pay items. The contractor bears the responsibilities for any change in estimated quantities. Any costs due to changed or unforeseen conditions as well as added or deleted work are negotiated using standard practices.

#### *Benefits/Risks*

Lump Sum is designed to reduce quantity overruns due to errors in quantity calculations or changed field conditions. An added benefit is the reduction in paperwork related to quantity measurement and verification, allowing Department field personnel to spend more time on inspection of the work.

#### *Typical Project Profiles*

Typically Lump Sum bidding is used for simple projects such as resurfacing, bike paths, box culvert extensions and minor bridge widening.

#### *Other Considerations*

Ensure the design documents are clear and complete due to the nature of the contract. Pre-Bid meetings and formal partnering are strongly encouraged when Lump Sum provisions are used on a project. Regularly scheduled site meetings will ensure changes are readily addressed and accounted for and the schedule is kept up to date.

# SECTION III IMPLEMENTATION GUIDELINES

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## ■ A.TIME-BASED METHODS

### 1. Design/Build Modified Turnkey

#### *Introduction*

Design/Build (D/B) is a project delivery process in which the Department executes a single contract with one entity (design/builder) to provide engineering and construction services. By contrast, in the traditional design/bid/build approach, an engineer is commissioned to prepare drawings and specifications under a design contract, and a construction contractor is subsequently selected by competitive bidding to complete the project according to those plans and specifications.

The purpose of these guidelines is to establish the Department's process for procuring and administering highway and structure design and construction services within a single contract. The process will clearly delineate all known data to reduce the unknown risk transfer to the design/build team.

#### *Why Use Design/Build Modified Turnkey*

Traditionally, design and construction has been a three or four-party relationship whereby the owner holds separate contracts with a designer, a construction contractor and, in some cases, a construction manager. Design/Build, however, is a project delivery strategy that assigns both the design task and the construction task to a single contractor. The Department's role in a D/B Modified Turnkey process includes securing environmental documents, right-of-way and necessary permits, and coordinating utility relocation and railroad activity—what might be considered a 30 percent plan.

By shifting the responsibility for final project design, the parties acknowledge that lead responsibility for potential design problems has shifted from the Department as the owner to the design/build contractor. The scope of work will specify any additional responsibilities the D/B team will have in these activities.

The primary benefit of this concept is that a D/B project may be completed faster than one where the traditional steps of design/bid/build are followed. Another benefit of this approach is that all members of each proposing team contribute to the final project design, which reinforces the Department's partnering initiatives. As the design for each project develops, it becomes possible to incorporate the benefit of many years of valuable engineering and construction experience from numerous sources into each design step. This is a process that will result in design alternatives that make use of more innovative construction techniques and incorporates the latest technology.

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### *Project Types*

In general, the Modified Turnkey process should be used for projects where the scope of work is well defined, and the Department is able to produce design documentation with enough detail that the D/B team's design role starts with preparing final working drawings and specifications.

While Modified Turnkey might be considered for all types of projects, it can be most effective for those that are non-controversial in nature (i.e., with no unresolved political issues or outstanding public controversy unless cleared for NEPA). That could include new alignments, new bridges, bridge replacements, bridge rehabilitations, 4R (resurfacing, restoration, rehabilitation and reconstruction) projects, 3R (resurfacing, restoration and rehabilitation) projects, interstate preventive maintenance projects and emergency projects. Modified Turnkey can be especially effective on Intelligent Transportation System (ITS) installations.

Other drivers for implementing D/B include solving an emergency safety condition that cannot wait for normal procurement procedures; projects where it is extremely critical that a specific deadline is met; and benefiting from the general positive effects that D/B can bring, including shorter time to project completion, fewer claims, innovations through closer design/contractor relationships and the long term decrease in administrative costs for the owner, particularly if some phases of construction can begin prior to completion of the final design.

D/B is not the desired process for all projects. As stated earlier, it can be effective on well-defined projects that can benefit from compressed design and construction schedules. Regardless of project circumstances, D/B can offer an effective alternative to the traditional design/bid/build approach, however, projects requiring iterative design solutions developed with outside parties are not prime candidates for D/B.

Use caution on projects that have extensive involvement with:

- Federal Aviation Administration (FAA) for airport clearances
- Complex environmental issues
- Complex community concerns
- Railroads and train movements

### *Design Considerations*

1. Provide a clearly defined scope of work.
2. Generally projects that involve the following complicated design issues require special attention to determine if they would be good D/B candidates:
  - Unique or complicated geotechnical issues
  - Complex bridge or foundation issues
  - Potential to encounter mining issues (e.g., mine voids, coal seams)
  - Extensive or complex right-of-way or utility issues
  - Impact on adjacent projects, large events and environmental surroundings
  - Complex traffic control and staged construction sequencing
3. Complex geometric alignment issues may require additional design effort before proceeding as a D/B project.

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### *Award of Contract*

The award of this Modified Turnkey project must be to the responsible and responsive D/B team with the lowest bid price, but the winning D/B team must be comprised of a prequalified contractor and a design consultant with a current annual qualification package on file with the Bureau of Design's Consultant Agreement Division. Districts should use the standard CMS contract format, whether the selection is made using the Modified Turnkey or Request for Proposal Process.

AASHTO has recommended that any consultant or subconsultant involved in the development of a design-build bid proposal not be allowed to bid on that proposal or join a team bidding on that proposal, because of the potential that a real or perceived conflict of interest may result. Conflicts of interest should be clarified by PENNDOT in accordance with state laws and/or regulations and specified in the advertisement.

### *Construction Considerations*

The contractor must construct the project according to the approved schedule, design drawings and specifications. Projects can be delayed if miscommunications arise between the Department and the contractor where questions of responsibility crop up. Spelling out in the contract documentation up front as to who is responsible for each project detail and making daily use of critical path method update charts throughout the construction process can help eliminate potential delays.

### *Other Considerations*

#### **Design/Build Coordination/Commitment:**

1. Resources must be available to allow for expedited project reviews/approvals (District Office, Central Office, and Federal Highway Administration).
2. It is imperative that the project's early coordination includes design, construction, and maintenance staff in the selection of D/B candidate projects.

#### **Schedule:**

1. Consider letting schedule to take full advantage of D/B process.
2. Consider D/B when a compressed schedule can avoid adding another construction season to a project.
3. Consider projects that enable some portion of construction to begin before design is completed (i.e., foundation construction before completed final superstructure design, one substructure element at a time, etc.)

#### **Cost:**

1. Project is large enough to make it worthwhile for contractors to compete, or make it cost effective for the procurement agency to pay the competitors all or part of their costs of preparing the bid (usually an RFP procurement).
2. If desired, several smaller bridges on the same route may be grouped together to be bid as one project (usually a MTK procurement).
3. Use for replacement of large, multi-span bridges at existing locations, new major bridges, or superstructure replacements for major river bridges (may be either MTK or RFP).

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**Environment:**

1. Use primarily for projects cleared with a Categorical Exclusion Evaluation (CEE) under the National Environmental Policy Act (NEPA). Additionally, these projects need to be evaluated to determine if they meet the other D/B selection criteria.
2. Advertisement for D/B projects may not be done until NEPA clearance has been granted, however, a draft RFP proposal may be distributed prior to NEPA clearance.
3. Use caution on Environmental Impact Statement (EIS) type projects (usually large and may be controversial).
4. Use caution on projects that have involvement with:
  - Section 4 (f) (Public owned parks, recreation areas) includes Historic Preservation Act, Section 106 process
  - Section 6 (f) (lands purchased with Land and Water Conservation Funds)
  - Threatened and Endangered Species
5. Use caution on projects with complicated permit issues:
  - 105/404 permits
  - Coast Guard Permits
  - NPDES
6. Use caution on projects with complicated environmental mitigation that requires interagency coordination

**Right-of-Way (R/W):**

1. Use D/B on projects with non-complex R/W acquisition that can be completed prior to Notice to Proceed with construction.
2. Coordinate with the District R/W Administrator for determination of any and all issues that would prohibit use of D/B:
3. Use R/W Plan developed at the 30% design stage if no design changes are anticipated during final design phase. Only R/W needed for the project can be acquired.
4. Use of Conditional R/W Certificate to be upgraded before construction begins
5. Target projects when amicable settlements are anticipated versus condemnation
6. Use caution on projects that may have Preliminary Objections (POs)
7. Use caution on projects where detailed plans to determine R/W requirements are needed
8. Use caution on projects where R/W is on the critical path

**Utilities:**

1. Use on projects that will have minimal utility relocation that may be performed prior to or concurrent with construction.
2. Use caution on projects with the following utility involvement:
  - Major relocations
  - Any relocations where there is an extensive lead time for ordering materials

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**Fiscal:**

1. Ensure that the project is on the 12-Year Transportation Program.
2. Ensure that funding is in place for design and construction.

**Emergency Projects:**

1. Use on projects where expediency is critical in order to preserve the safe travel of the motoring public.

**Scope of work**

1. The scope of work represents the Department's essential project expectations, and its purpose is to provide sufficient information upon which D/B teams can prepare bid proposals. The scope of work package developed by the Department must include design services and construction engineering required of the D/B team, the construction services required of the D/B team and the Department's responsibilities. The D/B requirements and services must include an itemized list of the information that will be furnished by the Department, and tasks to be accomplished by the D/B team.
2. The technical requirements listed in the request for proposals should be defined in performance terms instead of the more limiting prescriptive manner. The requirements should be comprehensive enough to assure that the intended result is achieved, but not restrictive in a way that inhibits creative solutions and design alternatives.
3. The Department will generally prepare the environmental documents, acquire right-of-way, secure necessary permits, and coordinate utility relocation and railroad activity. The scope of work will specify any responsibilities the D/B team will have in these activities.
4. The scope of work should define the construction engineering services to be provided by the D/B team, such as off-site prefabrication, quality control, shop drawings and review, as-built drawings, surveying and other services, as necessary for the project.
5. The scope or work should list whatever general design standards are to be followed, e.g., PENNDOT design manuals and AASHTO specifications, etc.
6. The scope of work should reference the Department's standard specifications and any applicable special provisions. Additionally, the scope should state whether there are any particular construction processes, traffic control requirements, construction phasing, or techniques that need to be followed to construct the project.
7. The scope of work should describe any documentation (including but not limited to design plans, shop drawings or engineering calculations) that is to be received by the Department for the purpose of verification of compliance with specified criteria. The scope should define any partially developed milestone plans (e.g., 60 percent, 90 percent) required for submission, review and approval by the Department prior to plan completion. Partial construction plans shall require sealed drawings and specifications prior to beginning construction on that specific phase.



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8. The scope of work must describe the final documents required by the Department from the D/B team upon completion of the project. These should include record final plans (100 percent automated and compatible with the Department's CADD system), engineering reports, shop drawings, test results, documentation, daily reports and item quantities.
  9. The scope of work should identify the Disadvantaged Business Enterprise (DBE) goals, which will be established on a project-by-project basis.
  10. The scope of work should specify any survey information required by the Department and identify for the teams any available survey information.
  11. The Department should perform some preliminary geotechnical work in the preparation of the scope of work and provide copies of any available geotechnical information. The scope of work should specify any additional geotechnical information or reports that will be required by the Department. Each D/B proposal will identify geotechnical investigation responsibilities.
  12. The scope of work should include a list of the Department's computer programs that are available for use by the D/B team during the design and construction of the project, and specified software and file formats for the plan and specification submissions.
  13. The scope of work should state the Department's commitment to review and approval of design submissions from the D/B team.
  14. The scope of work should identify any incentives/disincentives for achievement of key milestones ahead of schedule.
  15. The scope of work should address the use of value engineering for the project, which may be permitted, but only after being evaluated by the Department and the D/B team.
  16. The scope of work should include an issue-escalation matrix or process that clearly defines the process for addressing questions or disagreements that may arise. This process should identify a resolution ladder within the Department and require the D/B team to provide a similar list of people in responsible charge. For the Department, the escalation should begin with the project manager and continue through the District Engineer, to the Deputy Secretary for Highway Administration. Each level of resolution should also include a time frame for resolving the conflict. Partnering is highly recommended on all D/B projects in order to enhance teamwork.
  17. Any professional liability insurance requirements must be included in the scope of work. The insurance will be project specific and the dollar amount and term (length of time) clearly spelled out in the scope. The successful D/B team shall provide a performance and payment bond for the construction portion of the contract that complies with the requirement of bonds given in PENNDOT's Publication 408 on construction specifications.
  18. If warranties are to be included, the scope of work should clearly outline the details of the required warranty, covering the elements to be warranted and the time frame of the warranty. The scope will specify the required service life of pavement and type if limited to asphalt or concrete.
  19. All insurance and bonding requirements should be included in the scope of work.

The following checklist should be used as a guide when developing the scope of work.

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## Design/Build

### Checklist for Scope of Work Development

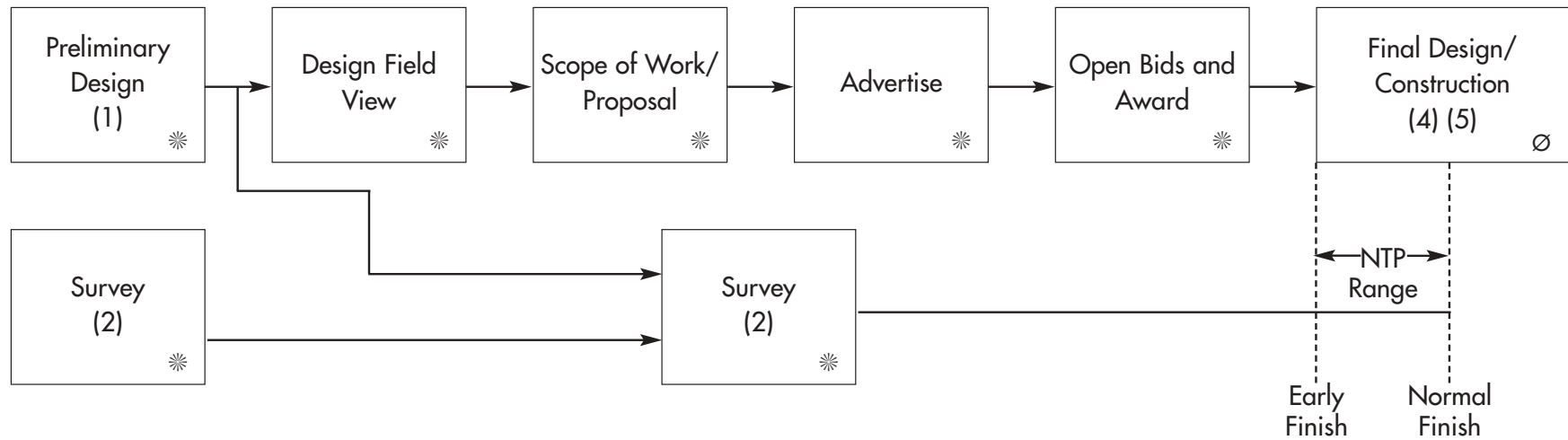
- ☐ Design services requirements
- ☐ Designer qualifications requirements
- ☐ Construction engineering requirements
- ☐ Construction project management requirements

Has the Department:

- ☐ Furnished environmental documents? (If no, expected date available \_\_\_\_\_)
- ☐ Provided Right-of-Way information? (If no, expected date available \_\_\_\_\_)
- ☐ Secured Permits? (If no, expected date available \_\_\_\_\_)

Will the Department:

- ☐ Coordinate utility activity? (If no, document reasons for proposed course of action)
- ☐ Coordinate railroad activity? (If no, document reasons for proposed course of action)
- ☐ Provide survey data? (If no, document reasons for proposed course of action)
- ☐ Provide geotechnical information? (If no, document reasons for proposed course of action)
- ☐ Provide computer programs for use? (If no, document reasons for proposed course of action)
- ☐ D/B Submission requirements and turnaround time commitments for Department review and approval
- ☐ Special construction processes/phasing
- ☐ Construction methods required
- ☐ Traffic control requirements
- ☐ Documentation requirements (for verification purposes)
- ☐ Final documents requirements (type and file format)
- ☐ Survey information required
- ☐ Geotechnical information required
- ☐ Escalation matrix
- ☐ Insurance and bonding requirements
- ☐ Total funds available
- ☐ Other \_\_\_\_\_
- ☐ Other \_\_\_\_\_
- ☐ Other \_\_\_\_\_



✱ –PennDOT Responsibility  
 Ø –D/B Team Responsibility

- (1) Environmental clearances; line, grade, and typical section; H & H report; preliminary TS&L; preliminary foundation; preliminary utilities; R/W plan and plats; preliminary permits; preliminary quantities; preliminary constructability review; preliminary M&P; preliminary borings/geotechnical plan; pre-bid schedule; and pavement design (including Life Cycle Cost Analysis).
- (2) Establishment of centerline and proposed limits of right-of-way.
- (3) Includes preparation of plan, appraisals, and acquisition.
- (4) Final E & S plan; 404, 105 and other permits; PUC Submissions and field conference; soils report; final pavement design; utility design and relocation (agreements and permits); core borings; final foundation plans; final TS&L; geotechnical report; drainage design; traffic control plans; final bridge and roadway design; constructability reviews; environmental mitigation report implementation.
- (5) Construction inspection will be performed by the Department and/or consultant inspector not affiliated with the D/B team.

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## 2. A+Bx Bidding

### *Introduction*

This bidding method involves time and an associated cost to determine the low bidder. The “A” component represents the traditional bid value on items such as material, equipment and manpower. The “Bx” component is a product of the length of time the bidder estimates the project will take multiplied by the road user cost. The contract is awarded to the bidder with the lowest combined factor.

Prior to bidding, Department officials and potential contractors should hold constructability reviews to analyze the proposed construction procedures. The project’s feasibility is evaluated to determine if the use of A+Bx bidding will satisfy all project goals cost effectively and within desired time constraints. This review should also determine if alternative approaches might be used in the project. If only one approach is determined to be feasible the RFP should be designed to require this. The details of potential third-party conflicts involving utilities, railroad agreements, environmental/archaeological issues, hazardous materials, public support issues, and other potential problems should also be addressed in the constructability review, and a plan worked out to lessen the potential for these conflicts. These constructability reviews are suggested to insure the best results for all innovative contracting techniques.

### *Why Use A+Bx Bidding*

The A+Bx method evaluates the overall impact the project will have on the traveling public, both financially and by equating a value to their time. A+Bx should be considered when there is a need to shorten the overall duration of a project. This method encourages innovation for the contractors to do the best job in the shortest time possible. Industry experience strongly suggests including an incentive/disincentive provision with an A+Bx Bidding contract. This motivates the contractor to not only place a bid with a compressed schedule in order to be awarded the contract, but to actually follow through with that schedule in order to gain the incentive. A+Bx Bidding method is most effective when multiple bidders are expected on a particular project, as this ensures a more accurate comparison of the Bx component.

Road user costs (RUC) place a value on the delay time (vehicle-hours/day) expected from roadway construction. It is estimated based on the project’s road classification, traffic volume data and the traffic control plans and converted into a monetary value by applying a “value to time” (“\$/vehicle-hour” or “\$/person-hour”). The value of lost time varies but generally includes the costs of people’s time, vehicle operation, accident and traffic violation, etc.

### *Project Types*

A+Bx bidding is appropriate for projects on high-volume roads where early completion of the entire project or a portion of the project will result in a significant benefit to the traveling public. The benefit is measured in terms of RUC, traffic safety, and traffic maintenance.

### *Design Considerations*

1. Determine if the A+Bx provision will apply to the entire project or specific items of work, or if there will be multiple Bx components.
  - Apply to all items that will severely impact the traveling public.
  - Special Provisions must clearly identify areas of the project where the A+Bx provision will be applied in choosing the successful bidder.

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2. Determining the schedule and completion date for the A+Bx provision
    - The schedule for the contract is determined using CPM to calculate a completion date.
    - Use available history of similar projects, input from PENNDOT personnel and outside expertise to assure a realistic schedule.
    - Calendar days are more effective than workdays. Using calendar days limits the confusion and makes it clear what the motivation is for the incentive.
    - Make sure to consider the season for weather, holidays, and events when determining a completion date.
    - The completion date for the project can be changed to match the successful bidder's schedule.
    - It is recommended that incentive/disincentive provision always be stipulated in an A+Bx contract. If these innovative bidding procedures are combined, refer to the Incentive/Disincentive Implementation Guidelines for correct implementation.
  3. Determining the Road-User Cost for A+Bx bidding
    - The "x" component represents the Road-User Cost.
    - This is a project specific value expressed as \$/time unit (generally hours or days) that is customized for each project.
    - The number is multiplied by the amount of time the contractor estimates in the bid proposal and is added to the cost estimate to determine the low bidder.
    - The road users cost must be balanced against the total project cost. The use of a low road user cost on a high cost project may cause problems. The contractor may use a low number of days to complete the project in order to be awarded the project, with the intent to pay the low road user cost if they exceed the identified number of days to complete the project.
    - For more information on calculating Road-User cost see Design Manual 1A.10.5J
  4. Pre-Bid meetings are mandatory for all projects using innovative bidding provisions.

#### *Award of Contract*

The project RFP must include information that the proposed contract will be awarded under A+Bx bidding. The applicable RUC value, along with the information used to calculate it should also be included. Incentive/Disincentive provisions along with maximum and minimum awarding schedules and provisions covering Liquidated Damage assessments should also be listed.

After the bids are submitted, the A+Bx equation is applied to each bid to determine the lowest bid amount. The contract is awarded to the project with the lowest combined bid amount as determined by the formula.

#### *Construction Considerations*

A successful A+Bx project is one that has open lines of communication between the contractor and inspector. Open communication can prevent delays in the field, which can cause major time losses, financial losses and claims. In order to ensure open lines of communication during construction, there are specific items that the Department can do. Some of these items are listed below:

1. Formal partnering is strongly encouraged when A+Bx bidding clauses are used on a project.
2. Regularly scheduled site meetings will ensure changes are readily addressed and accounted for to monitor and keep the schedule up to date.

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3. Ensure that a person with decision-making authority is accessible to the contractor to provide prompt answers to questions. This is especially important for night and weekend work.
  4. It is very important to closely monitor the construction using the CPM schedule prepared by the contractor. This ensures the contractor is adhering to the schedule, limits confusion and ensures for timely adjustments should problems arise. The contractor must provide a completion date schedule for review and approval prior to work, as specified in the contract special provisions. The inspector should closely monitor the schedule to ensure construction is progressing as expected.
  5. If an incentive/disincentive clause is combined with the A+Bx provision, ensure the intent for the incentive is understood. By doing this the contract will be enforced more effectively.
  6. It should be understood that time extensions will only be given under extraordinary circumstances, and the burden of proof lies with the contractor. As with most contracts, additional and extra work must be expected. The contractor will be paid for that work but efforts should be made to absorb the time into the schedule and not increase the time to receive the incentive.

As with all time-based contracts, close monitoring and inspection is essential for a successful project. Chargeable workdays need to be accounted for. Non-work days are accounted for in accordance with standard procedures.

#### *Other Considerations*

It is recommended to always include incentive/disincentive provisions with Design/Build contracts. The actual calculated value of those incentives can be determined using the RUC multiplied by the number of days in question. For instance, an incentive clause might provide a bonus for the contractor in the amount of the number of days the project finished ahead of schedule multiplied by the RUC, likewise for a disincentive for a project that finishes behind schedule.

### **3. Lane Rental**

#### *Introduction*

Lane Rental is an innovative bidding method in which a provision is added to the contract to assess a rental fee for the inconvenience of having lane or shoulders closed during the project. This provision encourages contractors to minimize road user impacts, lane closures and other traffic restrictions during construction. In the bid documents the contractor must estimate the amount of time and number of closures necessary to complete the lane or shoulder work. A fee is assessed to the contractor for each day or partial day the lane or shoulder is inaccessible to traffic. The contractor is thus motivated to keep lane restrictions to a minimum in terms of length, duration and frequency.

#### *Why Use Lane Rental*

This innovative bidding method may be used on projects of critical nature where there is motivation to keep travel lanes as unobstructed as possible. Lane Rental may be combined with other innovative bidding methods.

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### *Project Types*

Lane Rental provisions are appropriate for projects that will have a great negative impact on the traveling public in the project area. If the project is in an area where the use of alternate routes or detours is impractical, making it impossible to reroute the traffic away from the construction site, a lane rental provision emphasizes the necessity of minimizing lane and shoulder closures to the contractor. Analysis of the road user cost in the project area would show that the benefit of reducing impact to the traveling public is greater than the additional cost to minimize lane closures. See the matrix in Appendix C to evaluate a specific project.

### *Design Considerations*

1. Determine project limits to which the Lane Rental provision will be applied. There may be multiple areas.
  - Evaluate whether Lane Rental fees will be applied to full lane closures, partial lane closures, and or shoulder closures. Apply to all items that will severely impact the traveling public.
  - Special Provisions must clearly identify areas of the project to which the Lane Rental provision will be applied.
  - Special Provisions must clearly define closures, rental fee assessment, and what constitutes an open and closed lane or shoulder.
2. Determine the schedule and completion date for the Lane Rental provision
  - The schedule for the contract is produced using a CPM schedule to calculate a completion date.
  - Use available history of similar projects, input from PennDOT personnel, and outside expertise to assure a realistic schedule.
  - Calendar days are more effective than workdays. Using calendar days limits the confusion and makes it clear what the motivation is for the incentive.
  - Make sure to consider the season for weather, holidays, and events.
3. Determine the unit of time the Lane Rental fee will be charged.
  - Evaluate the traffic patterns through the area.
  - Use available history of similar projects, input from PennDOT personnel, and outside expertise to determine a realistic time frame for the work in the areas where Lane Rental fees will be applied. For example it may be reasonable to charge by the hour, half hour, day or half day depending on the type of work being performed.
4. Determine the Lane Rental Fee
  - This is a project-specific value that is customized for each project based on the road user cost and calculated prior to the contract being advertised. For more information on calculating Road-User cost see Design Manual 1A.10.5J
  - Lane Rental will be a line item in the contract with the fee attached.
  - The fee is charged to the contractor for the specified unit of time the lane is unavailable to the traveling public. This fee amount should be adequate to benefit the contractor to encourage interest in bidding, stimulate ideas and increase profitability of meeting tight schedules.
5. Pre-Bid meetings are mandatory for all projects using innovative bidding provisions.

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### *Award of Contract*

The contract should be advertised clearly as including Lane Rental provisions. The bidders will specify how many days the lanes will be closed. The schedule will be adjusted based on the contractor's schedule. If the contractor is able to open the lanes to the travelling public ahead of scheduled the lane rental fee will not be charged for the additional days. However, if the contractor remains in the lanes for an extended period of time, the lane rental fee will continue to be charged for the additional days. The contract is awarded in the standard way.

### *Construction Considerations*

1. Formal partnering is strongly encouraged when Lane Rental provisions are used on a project.
2. As with all time-based contracts, close monitoring of the project is necessary for successful completion. In a Lane Rental contract, accurate records must be kept to document the amount of time the lane is closed to traffic. Monitor inspection, documentation, rental assessments and work performance continuously.
3. Confirm whether the presence of inspection staff is necessary during a single long shift up to 16 hours/day if required.
4. Use a CPM schedule for analysis.
5. Apply quick decision-making and in-depth knowledge of contract documents.

### *Other Considerations*

The lane rental costs will be encumbered by the contractor in the contract and may be a negative aspect of the lane rental provision.

## **4. Incentive/Disincentive for Early Completion**

### *Introduction*

Incentive/Disincentive (I/D) for early completion is an innovative bidding method by which the Department adds a contract provision to compensate the contractor with a bonus for reaching critical milestones or completing an entire project ahead of schedule, and deducting a charge for missing a milestone or finishing behind schedule.

Incentive/Disincentive provisions should not be confused with liquidated damages. Liquidated damages are meant to recover additional costs associated with the contractor's failure to complete the project on schedule. The I/D provision is generally for a much larger dollar amount and is intended to motivate the contractor to complete the work ahead of schedule.

### *Why Use Incentive/Disincentive for Early Completion*

Incentive/Disincentives may be added to contracts when the Department would like to ensure that a project, or a phase of a project, is completed on schedule or when the Department would like to achieve the earliest possible completion date for a project or phase of a project. I/Ds will provide a means to motivate a contractor to complete a project on or ahead of schedule for critical projects where a large number of travelers and/or businesses are inconvenienced by the construction activity. The primary objective of expediting project completion is to minimize traffic inconvenience and delays.



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### *Project Types*

I/D provisions are applicable to projects with potential for a negative impact on the traveling public and businesses. The negative impact may be caused by lengthy detours or delays or the inaccessibility of adjacent properties by users or emergency services. Another suitable project may include new construction that is completing a critical portion of a system and once it is completed the traveling public may have a great benefit. Emergency projects and ones that must be completed before a major travel event may be good candidates for I/D provisions.

### *Design Considerations*

A project should be identified as Incentive/Disincentive for Early Completion in the beginning of the design process.

Once it has been determined to include Incentive/Disincentive for Early Completion clauses in a contract some decisions must be made in the pre-bid portion of the final design phase. Three of these issues are if the I/D will apply to the entire project or specific items of work, the amount of time for the I/D provision, and the amount of money to be awarded as an incentive or withheld in the form of a disincentive. These issues are discussed in more detail below.

1. Determining if the Incentive/Disincentive provision will apply to the entire project or specific items of work.
  - Apply to all items that will severely impact the traveling public.
  - Special Provisions must clearly identify measures the Department will use to assess I/D payments and liabilities.
2. Determining the time for the Incentive/Disincentive provision
  - The time for I/D applies to the schedule the contractor must meet or exceed in order to receive any of the incentive portions of the contract or if the contractor runs over the time, it is the time for which the contractor will be charged the disincentive fee.
  - The schedule for this portion is produced using a CPM schedule. The time is compressed as much as is realistic by using extended shifts, extra workers, and longer work days or any other resources that will assist in compressing the schedule.
  - Use available history of similar projects, input from PennDOT personnel, and outside expertise to assure a realistic compressed schedule. Use caution on including the I/D clause on projects using new construction methods. If it is necessary to use on a project with new methods, seek industry input to create a realistic schedule.
  - Select the appropriate unit of time to apply to the I/D provision. Study all aspects of the impacted area and project to determine if it would be most effective to offer incentives/disincentives for full days, half days, hours, or parts of an hour.
  - If the I/D time is measured in days, calendar days are more effective than work days. Using calendar days limits the confusion and makes it clear what the motivation is for the incentive.
  - Make sure to consider the season for weather, holidays, and events.
  - Once the contract is let, the incentive is set and the contractor is expected to meet it. Only under extreme circumstances should exceptions be made, therefore it is very important to use all resources available to calculate an accurate I/D time.

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- 3 Determining the Incentive/Disincentive Rate
    - The I/D rate is independent from the total contract cost.
    - I/D rate is calculated per the unit of time in which it will be measured.
    - Use road user cost to calculate I/D rate. This will reflect the actual benefit for the incentive to the traveling public or inconvenience for an overrun schedule. For more information on calculating Road-User cost see Design Manual 1A.10.5J
    - The I/D amount is determined on a project-by-project basis.
    - Place upper limits on financial incentives and use an unlimited disincentive amount.
  4. Pre-Bid meetings are mandatory for all projects using innovative bidding provisions.

Incentive/Disincentives for Early Completion can be successful when used on appropriate projects. Ensure the Plans, Specifications, and Estimates (PS&E) package is complete, do not rush to bid opening with an incomplete PS&E. The goal is to reasonably compress the schedule so the contractor will be motivated to put forth the extra effort necessary to earn the maximum incentive.

#### *Award of Contract*

A contract using Incentive/Disincentive for Early Completion clauses is advertised as any other contract with the special status clearly explained. The contract is awarded in the standard way.

#### *Construction Considerations*

A successful Incentive/Disincentive project is one that has open lines of communication between the Contractor and Inspector. Open communication can prevent problems in the field that can cause major time losses, financial losses, and claims.

In order to ensure open lines of communication during construction, there are specific items that the Department can do. Some of these items are listed below:

1. Formal partnering is strongly encouraged when I/D clauses are used on a project.
2. Regularly scheduled site meetings will ensure changes will be readily addressed and accounted for to monitor and keep the schedule up to date.
3. Ensuring a person with authority for decision making is accessible to the contractor to provide prompt answers to the contractor's questions. This is especially important for night and weekend work.
4. It is very important to closely monitor the construction. This ensures the contractor is adhering to the schedule and limits confusion. The contractor must provide a completion date schedule for review and approval prior to work as specified in the contract special provisions. The Inspector should closely monitor the schedule to ensure construction is progressing as expected.
5. Understand the intent of the incentive/disincentive. By doing this the contract will be enforced more effectively.
6. It should be understood that time extensions will only be given under extraordinary circumstances, and the burden of proof lies with the contractor. As with most contracts, additional and extra work must be expected. The contractor will be paid for that work but efforts should be made to absorb the time into the schedule and not increase the time to receive the incentive.

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### *Other Considerations*

Incentive/Disincentive clauses are generally only applied to work that affects motorists but does not affect liquidated damage charges.

## **B. QUALITY-BASED METHODS**

### **1. Design/Build-Request for Proposal.**

#### *Introduction*

Design/Build (D/B) is a project delivery method in which the owner executes a single contract with one entity (designer-builder) to provide engineering and construction services. By contrast, with the design/bid/build approach, the owner commissions an engineer to prepare drawings and specifications under a design contract, then subsequently selects a construction contractor by competitive bidding. The purpose of these guidelines is to establish the Department's process for procuring and administering highway and structure design and construction services within a single contract. The process will clearly delineate all known data to reduce the unknown risk transfer to the design-build team.

In the Request for Proposal (RFP) process the Department provides general technical criteria, to which each D/B team responds with a separately sealed technical proposal and price proposal. RFP procurement provides the Department with the most potential for multiple design solutions and innovation in the use of materials and systems. In general, the RFP process should only be considered for projects that exceed a \$25 million threshold (ITS projects may have a lower threshold), unless the project is substantially complex, and multiple design solutions and creativity are desired by the Department.

The Department establishes a technical review committee to develop the RFP and evaluate the proposal submissions in accordance with the Commonwealth's procurement code. The technical proposals are scored relative to the quality of the technical content then the price proposals are opened and factored into the overall score. The award is given to the D/B team determined to provide the Department with the best-value project. The D/B team must be comprised of a prequalified contractor and a design consultant with a current annual qualification package on file with the Bureau of Design's Consultant Agreement Division.

In the event that the anticipated cost for proposal preparation is relatively high, the Department should consider paying a stipend to the unsuccessful bidders. Excessive submittal requirements without compensation may discourage qualified teams from participating in D/B projects. This stipend is an indication of the Department's commitment to awarding and receiving a quality project. Additionally, by paying a stipend to participants, the Department may use documents and design concepts from the unsuccessful proposals. Stipends will only be awarded to those proposals that attain a score of 70 percent or higher (in accordance with the evaluation criteria), with a maximum of three stipends being awarded. These stipends will be awarded to the three highest technical scores of the unsuccessful bidders.

*Mandatory Scoping Field Views* – Any D/B contractor submitting an RFP must attend the mandatory scoping field view and pre-bid meeting.

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### *Why Use Design-Build RFP Process*

Design-Build is a project delivery strategy that assigns both the design task and the construction task to a single contractor. Traditionally, design and construction has been a three or four-party relationship where the owner holds separate contracts with a designer, a construction contractor and in some cases, a construction manager. By shifting the responsibility for project design, the parties also shift lead responsibility for potential design problems from the owner to the design-builder.

The primary benefit of the D/B concept is that a project may be completed faster than if the traditional steps of design/bid/build are followed. Another benefit of this approach is that all members of each proposing team contribute to the final project design, which reinforces the Department's partnering initiatives. As the design for each project is developing, it is possible to incorporate the benefit of many years of valuable engineering and construction experience into each design process.

Other drivers for D/B include solving an emergency safety condition that cannot take the time to go through the normal procurement procedures; projects where it is extremely critical that a specific deadline is met; and benefiting from the general positive effects that D/B brings, including shorter time to project completion, fewer claims, innovations through closer design/contractor relationships and the long-term decrease in administrative costs for the owner, particularly if some phases of construction can begin prior to completion of the design.

Design-build is not the desired process for all projects. Typically, it is effective on projects that are well defined and that serve to benefit from compressed design and construction schedules. Regardless of project circumstances, D/B offers an effective alternative to the traditional design/bid/build approach. However, projects requiring iterative design solutions developed with outside parties are not prime candidates for D/B.

### *Project Types:*

Consider D/B for all types of projects, including new alignments, new bridges, bridge replacements, bridge rehabilitations, 4R (resurfacing, restoration, rehabilitation and reconstruction) projects, 3R (resurfacing, restoration and rehabilitation) projects, Interstate Preventive Maintenance projects, emergency projects, Intelligent Transportation System (ITS) projects, and projects that are non-controversial in nature (i.e. no unresolved political issues or outstanding public controversy unless cleared for NEPA). The Request for Proposal process however should only be considered for projects that exceed a \$25 million threshold (ITS projects may have a lower threshold), unless the project is substantially complex, and multiple design solutions and creativity are desired by the Department.

Use caution on projects that have extensive involvement with:

- Federal Aviation Administration (FAA) for airport clearances
- Complex environmental issues
- Complex community concerns
- Railroads and train movements

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### *Design Considerations*

1. Provide a clearly defined scope of work.
2. Generally projects involving the following complicated design issues require special attention to determine if they would be good D/B candidates:
  - Unique or complicated geotechnical issues
  - Complex bridge or foundation issues
  - Potential to encounter mining issues (e.g., mine voids, coal seams)
  - Extensive or complex right-of-way or utility issues
  - Impact on adjacent projects, large events and environmental surroundings
  - Complex traffic control and staged construction sequencing
3. Complex geometric alignment issues may require an additional design effort before proceeding as a D/B project.

### *Award of Contract*

The contract for D/B services should be made on the basis of lump sum fixed price. Districts should use the standard CMS contract format, whether the selection is made using the Modified Turnkey or RFP process.

### *Construction Considerations*

The contractor must construct the project according to the approved schedule, design drawings and specifications. Projects can be delayed if miscommunications arise between the Department and the contractor where questions of responsibility crop up. Spelling out in the contract documentation up front who is responsible for each project detail and making daily use of critical path method update charts throughout the construction process can help eliminate potential delays.

### *Other Considerations*

#### **Design/Build Coordination/Commitment:**

1. Resources must be available to allow for expedited project reviews/approvals (District Office, Central Office, and Federal Highway Administration).
2. It is imperative that the project's early coordination includes design, construction, and maintenance staff in the selection of D/B candidate projects.

#### **Schedule:**

1. Consider letting schedule to take full advantage of D/B process.
2. Consider D/B when a compressed schedule can avoid adding another construction season to a project.
3. Consider projects that enable some portion of construction to begin before design is completed (i.e., foundation construction before completed final superstructure design, one substructure element at a time, etc.)

#### **Cost:**

1. Project is large enough to make it worthwhile for contractors to compete, or make it cost effective for the procurement agency to pay the competitors all or part of their costs of preparing the bid (usually an RFP procurement).
2. If desired, several smaller bridges on the same route may be grouped together to be bid as one project (usually a MTK procurement).

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3. Use for replacement of large, multi-span bridges at existing locations, new major bridges, or superstructure replacements for major river bridges (may be either MTK or RFP).

#### **Environment:**

1. Use primarily for projects cleared with a Categorical Exclusion Evaluation (CEE) under the National Environmental Policy Act (NEPA). Additionally, these projects need to be evaluated to determine if they meet the other D/B selection criteria.
2. Advertisement for D/B projects may not be done until NEPA clearance has been granted, however, a draft RFP proposal may be distributed prior to NEPA clearance.
3. Use caution on Environmental Impact Statement (EIS) type projects (usually large and may be controversial).
4. Use caution on projects that have involvement with:
  - Section 4 (f) (Public owned parks, recreation areas) includes Historic Preservation Act, Section 106 process
  - Section 6 (f) (lands purchased with Land and Water Conservation Funds)
  - Threatened and Endangered Species
5. Use caution on projects with complicated permit issues:
  - 105/404 permits
  - Coast Guard Permits
  - NPDES
6. Use caution on projects with complicated environmental mitigation that requires inter-agency coordination

#### **Right-of-Way (R/W):**

1. Use D/B on projects with non-complex R/W acquisition that can be completed prior to Notice to Proceed with construction.
2. Coordinate with the District R/W Administrator for determination of any and all issues that would prohibit use of D/B:
3. Use R/W Plan developed at the 30% design stage if no design changes are anticipated during final design phase. Only R/W needed for the project can be acquired.
4. Use of Conditional R/W Certificate to be upgraded before construction begins
5. Target projects when amicable settlements are anticipated versus condemnation
6. Use caution on projects that may have Preliminary Objections (POs)
7. Use caution on projects where detailed plans to determine R/W requirements are needed
8. Use caution on projects where R/W is on the critical path

#### **Utilities:**

1. Use on projects that will have minimal utility relocation that may be performed prior to or concurrent with construction.
2. Use caution on projects with the following utility involvement:
  - Major relocations
  - Any relocations where there is an extensive lead time for ordering materials

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**Fiscal:**

1. Ensure that the project is on the 12-Year Transportation Program.
2. Ensure that funding is in place for design and construction.

**Emergency Projects:**

1. Use on projects where expediency is critical in order to preserve the safe travel of the motoring public.

***Guidelines for the Technical Review Committee (TRC)***

The panel responsible for evaluating the D/B proposals should include individuals who may be from within or outside the Department, are knowledgeable in the D/B process, and are specifically educated in the particular technical issues applicable to the project. The TRC will score each D/B proposal. The membership should include a mix of federal, state, local or private engineers, and should include individuals with the relevant knowledge to evaluate the various disciplines of the proposal, such as bridge and roadway design, construction and maintenance, scheduling consultants, geotechnical engineers, etc.

***Evaluation Criteria of Technical Proposal***

The following guidelines should be used when evaluating the technical portion of the RFP submissions. The TRC should establish the point values and areas of evaluation. Point values and areas of evaluation should be adjusted to reflect the requirements of individual projects, however, the emphasis should remain on the technical aspects of the proposal, and the total point value is recommended to be 100. The recommended categories are as follows:

**Understanding the Scope** – Has the D/B team clearly demonstrated an understanding of the scope of work and communicated how it intends to provide all needed services?

**Experience of Key Personnel** – What is the competency of professional personnel who would be assigned to this project? Qualifications of personnel should be measured by experience and education, with particular reference to experience on projects similar to that described in the RFP. Proposals should also include the consultant's management plan in the event that key personnel (those with authority on behalf of the firm) are not available.

**Experience of Companies** – What is the ability of the designer and contractor to meet the terms of the RFP, especially the quality, experience and past performance on similar projects?

**Soundness of Approach** – Comprised of the following elements:

*Quality of Design* – Has the D/B team selected and properly utilized design criteria and methods appropriate for their proposal?

*Maintainability* – Will the proposed design provide for minimal maintenance and preservation?

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*Schedule* – Is the proposed schedule comprehensive, realistic and attainable? What is the overall duration of the project?

*Community Impacts* – Does the proposal seek to minimize impacts on nearby communities?

*Aesthetics* – Does the proposed design provide the appropriate blend of design and setting?

*Type of Construction* – Will the proposed construction features and processes result in a highly quality project? Are the construction features supported by a Quality Control plan?

*Maintenance and Protection of Traffic* – Does the proposal seek to minimize traffic disruption?

*Safety* – Does the proposal strive to ensure safe conditions for the construction personnel and the traveling public?

*Environmental Considerations* – Does the proposal address potential environmental concerns, including mitigation plans?

Each TRC member should thoroughly review and preliminarily score the entire proposal for technical merit. After this review, a meeting will be held with other committee members, where each scorer will report their draft score to the RFP facilitator. The facilitator will compile a summary of the initial scores and supporting comments, and provide a copy to each reviewer. The facilitator will lead the TRC through a group discussion, addressing all items, initial scores and comments, and attempt to reach consensus. The reviewers will then complete their final score and return it to the facilitator.

The facilitator will calculate the average raw score for each item (from 0 percent to 100 percent) and multiply by the total points allocated for that item. The final summation of points for each item will be the D/B proposal's final score for technical merit. The summary of points for each proposal will be held in confidence until the price proposals are publicly opened.

**THROUGHOUT THIS ENTIRE PROCESS, CONFIDENTIALITY OF THE PROPOSALS IS CRITICAL, AND THE CONTENT SHOULD NOT BE DISCUSSED WITH ANY PERSON OUTSIDE OF THIS EVALUATION AND CONSENSUS MEETING.**

### *Price Proposals*

The price proposals, submitted with the technical proposals, will be opened by the Bureau of Design's Contract Awards Section. The Overall Value Ratings (OVR) will be determined by dividing each bidder's lump sum price by the corresponding score of each technical proposal. The proposal with the adjusted low-bid (best OVR) will be the apparent successful proposal, contingent on the Department's final determination that all submittals from that bidder are responsible and responsive.

*Example:*

<b>Proposal</b>	<b>Technical Score</b>	<b>LS Bid Price</b>	<b>Adjusted Bid</b>
A	84%	\$26,500,100.00	\$31,547,738.10
B	88%	\$28,265,410.00	\$32,119,784.09
C	73%	\$23,208,766.00	\$31,792,830.14



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In this case, Proposal A would be the proposal providing the Department with the best Overall Value Rating (OVR), and would be the apparent award recipient.

On the selected letting date, the three lowest adjusted bids (after factoring in the prices and technical scores) and the lump sum bid price for the apparent award recipient will be publicly read. The public reading of the lump sum price and computation of the OVR does not constitute a final determination by the Department of whether the price proposal is responsive, however, the Department may refuse to open price proposals from D/B teams whose technical proposal was considered non-responsive, or did not achieve the minimum technical score as determined by the TRC.

#### *Scope of Work*

1. The scope of work represents the Department's essential project expectations—its purpose is to provide sufficient information upon which D/B teams can prepare bid proposals. The scope of work package developed by the Department and the TRC will include the design services required, the construction engineering requirements, the construction services required and the Department's responsibilities. The D/B requirements and services shall include information to be furnished by the Department and tasks to be accomplished by the D/B team.
2. The technical requirements listed in the request for proposals should be defined in performance terms instead of the more limiting prescriptive manner. The requirements should be comprehensive enough to achieve the intended result, but not restrictive in a way that inhibits creative solutions and design alternatives.
3. The Department will be responsible for all environmental documents, securing permits, and acquiring right-of-way. The scope of work will specify the responsibilities the D/B team will have for environmental mitigation, right-of-way activities, acquiring permits and coordinating utility relocation and railroad activity.
4. The scope of work should define the construction engineering services to be provided by the D/B team, such as off-site prefabrication, quality control, shop drawings and review, as-built drawings, surveying and other services as necessary for the project.
5. The scope of work should define the general design standards to be followed, i.e., PENNDOT Design Manuals, AASHTO, etc.
6. The scope of work should reference the Department's standard specifications and any applicable special provisions. Additionally, the scope should reference whether there are any particular construction processes, traffic control requirements, construction phasing, or techniques that need to be specified to construct the project.
7. The scope of work should describe any documentation (including but not limited to design plans, shop drawings or engineering calculations) to be received by the Department for the purpose of verification of compliance with specified criteria. The scope should define any partially developed milestone plans (e.g. 60 percent, 90 percent) required for submission, review and approval by the Department prior to plan completion. Partial construction plans shall require sealed drawings and specifications prior to beginning construction on that specific phase.
8. The scope of work must describe the final documents required by the Department from the D/B team upon completion of the project. These should include record final plans (100 percent automated and compatible with the Department's CADD system), engineering reports, shop drawings, test results, documentation, daily reports and item quantities.

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9. The scope of work should identify the Disadvantaged Business Enterprise (DBE) goals, which will be established on a project-by-project basis.
  10. The scope of work should specify any survey information required by the Department and notify the teams of available survey information.
  11. The Department will perform some preliminary geotechnical work and preliminary pavement design in the preparation of the RFP. The Department will provide copies of any existing geotechnical information that is available. The scope of work should specify any geotechnical information or reports that will be required by the Department. Each D/B proposal will identify geotechnical investigation responsibilities.
  12. The scope of work should include a list of the Department's computer programs available for use during the design and construction of the project, and specified software and file formats for the plan and specification submissions.
  13. The scope of work should state the Department's commitment to review and approval of design submissions from the D/B team.
  14. The scope of work should identify any incentives/disincentives for achieving key milestones ahead of schedule.
  15. A final pavement design will be prepared in accordance with PENNDOT Pavement Policy Manual (Pub. 242) and may differ from the preliminary pavement design. However, changes to the pavement type will not be permitted.
  16. The scope of work should address the use of value engineering for the project. Value engineering may be permitted, after being evaluated by both the Department and the D/B team.
  17. The scope of work should include an issue escalation matrix that clearly defines the process for addressing questions or disagreements that may arise. This process should identify a resolution ladder within the Department and require the D/B team to provide a similar list of people in responsible charge. For the Department, the escalation should begin with the project manager and continue through the District Engineer, to the Deputy Secretary for Highway Administration. Each level of resolution should also include a time frame for resolving the conflict. Partnering is highly recommended on all D/B projects in order to enhance teamwork.
  18. Any professional liability insurance requirements must be included in the scope of work. The insurance will be project-specific and the dollar amount and term (length of time) clearly spelled out in the scope. The successful D/B team shall provide a performance and payment bond for the construction portion of the contract that complies with the requirement of bonds given in Publication 408.
  19. If warranties are to be included, the scope of work should clearly outline the details of the required warranty, covering the elements to be warranted and the time frame of the warranty. The scope will specify the required service life of pavement and type if limited to asphalt or concrete.
  20. All insurance and bonding requirements should be included in the scope of work.

The following checklist should be used as a guide when developing the scope of work.

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## Design/Build Checklist for Scope of Work Development

- ☐ Design services requirements
- ☐ Designer qualifications requirements
- ☐ Construction engineering requirements
- ☐ Construction project management requirements

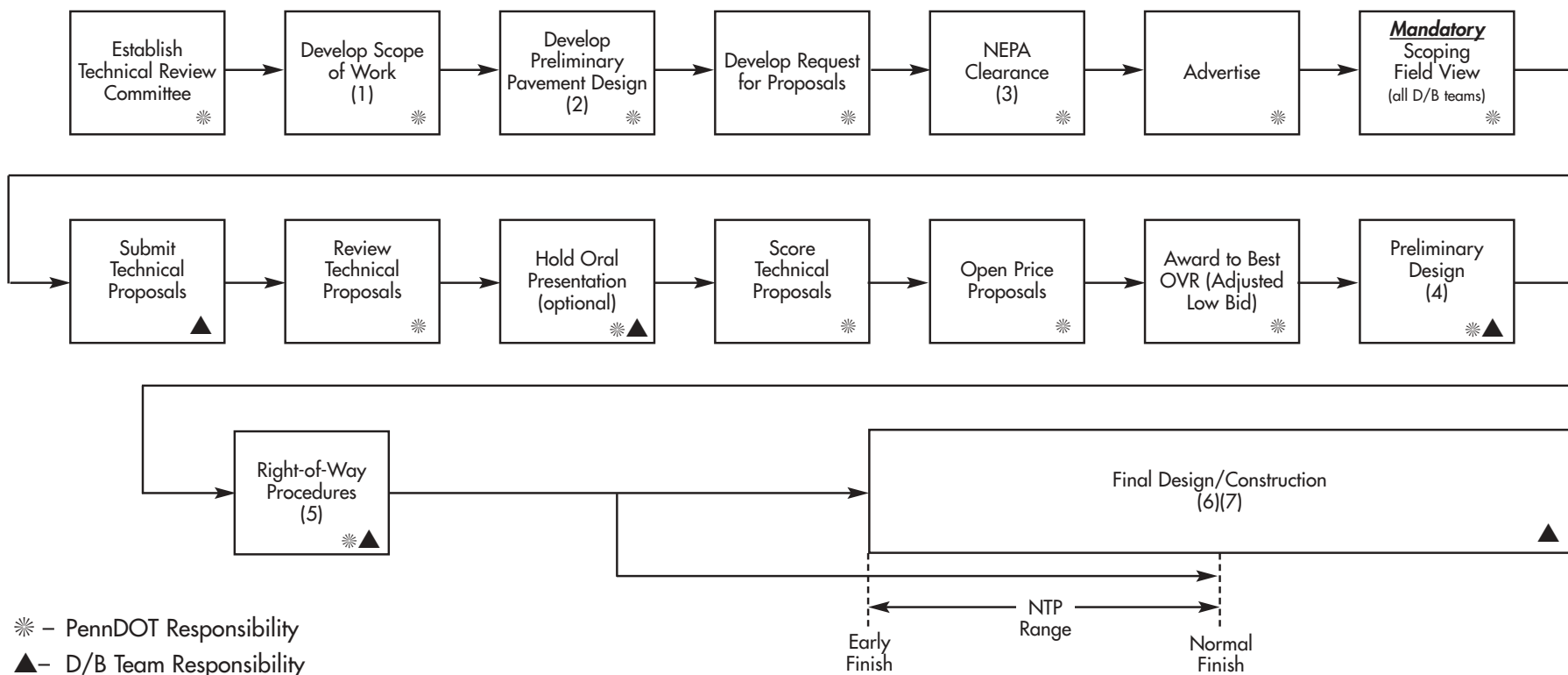
Has the Department:

- ☐ Furnished environmental documents? (If no, expected date available \_\_\_\_\_)
- ☐ Provided Right-of-Way information? (If no, expected date available \_\_\_\_\_)
- ☐ Secured Permits? (If no, expected date available \_\_\_\_\_)

Will the Department:

- ☐ Coordinate utility activity? (If no, document reasons for proposed course of action)
- ☐ Coordinate railroad activity? (If no, document reasons for proposed course of action)
- ☐ Provide survey data? (If no, document reasons for proposed course of action)
- ☐ Provide geotechnical information? (If no, document reasons for proposed course of action)
- ☐ Provide computer programs for use? (If no, document reasons for proposed course of action)
- ☐ D/B Submission requirements and turnaround time commitments for Department review and approval
- ☐ Special construction processes/phasing
- ☐ Construction methods required
- ☐ Traffic control requirements
- ☐ Documentation requirements (for verification purposes)
- ☐ Final documents requirements (type and file format)
- ☐ Survey information required
- ☐ Geotechnical information required
- ☐ Escalation matrix
- ☐ Insurance and bonding requirements
- ☐ Total funds available
- ☐ Other \_\_\_\_\_
- ☐ Other \_\_\_\_\_
- ☐ Other \_\_\_\_\_

# Design/Build Request for Proposals Process



(1) Includes internal scoping field view.

(2) The preliminary pavement design and Life Cycle Cost Analysis (LCCA) will be prepared by the Department using Preliminary boring/geotechnical information.

(3) NEPA clearance must be obtained prior to advertisement. Process is ongoing throughout RFP development.

(4) Line, grade, and typical section; H & H report; preliminary TS&L; preliminary foundation; preliminary utilities; R/W plan and plats; preliminary permits; preliminary quantities; preliminary constructability review; preliminary M&P; pre-bid schedule. Begins with kick-off meeting and another scoping field view.

(5) Includes Department acquiring right-of-way based on the centerline and proposed R/W limits established by the D/B team.

(6) Prepare documents and applications for final E & S plan; 404, 105 and other permits; PUC Submissions and field conference; soils report; final pavement design; utility design and relocation (agreements and permits); core borings; final foundation plans; final TS&L; geotechnical report; drainage design; traffic control plans; final bridge and roadway design; constructability reviews. (Permits will be issued to and utility agreements will be made with the Department)

(7) The Department and/or consultant inspector not affiliated with the D/B team will perform construction inspection.

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## 2. Warranties

### *Introduction*

A warranty is “a guarantee of the integrity of a product and of the maker’s responsibility for the replacement or repair of deficiencies.” The emphasis on warranties in the highway construction industry places a guarantee on longer-term performance of highways.

### *Why Use Warranties*

By including a warranty on a work item or project the ultimate responsibility is shifted from the owner to the contractor. Warranties offer a solution to problems with work, which, when not properly performed, requires repairs within a few years.

### *Project Types*

Warranties are most successful when applied to projects where risks can be accurately defined. They work best on projects on high-volume, restricted access roads. Warranties are not successful on projects in urban areas where there are excessive impacts by other parties. Existing project conditions need to be well defined.

### *Design Considerations*

1. Ensure the design documents are clear and complete due to the nature of the contract.
2. Consider specific work items to which warranty provisions will be attached. Address work items that have historically been shown to require repairs within a few years if not done properly.
3. Determine the length of time for which the warranty will be required, typically two years to five years. The length will be specific to the work item—some work items seldom need repairs before five years.
4. Any factor of the design not under the contractor’s control must have little impact on the work being warranted during the warranty period.
5. Pre-bid meetings are mandatory for all projects using innovative bidding provisions.

### *Award of Contract*

A contract using Warranties is advertised as any other contract with the special status clearly explained. The contract is awarded in the standard way to the lowest qualified bidder.

### *Construction Considerations*

A successful project with Warranties is one that has open lines of communication between the contractor and inspector. Open communication can prevent problems occurring in the field, which can cause major time delays, financial losses, and claims. In order to ensure open lines of communication during construction, there are specific items that the Department can do. Some of these items are listed below:

1. Regularly scheduled site meetings will ensure that changes are readily addressed and accounted for to monitor and keep the schedule up to date.
2. Inspection requirements and paperwork are reduced because the contractor assumes the responsibility for quality. Owner inspection on the items with warranties is eliminated.
3. Formal partnering is strongly encouraged when warranties are used on a project.

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## C. OTHER METHODS

### 1. Lump Sum

#### *Introduction*

The bid documents for a Lump Sum project will not include a summary of quantities or other information detailing the quantities for the project work. The Department provides the potential bidders with complete bid documents and the bid will be made after the contractors calculate the quantities necessary to develop the lump sum amount. The bidding process requires the contract bidders to provide the Department with an estimate of a lump sum price as opposed to an estimate that lists individual pay items. The Lump Sum bidding method is typically suited for simple projects that have limited scope.

#### *Why Use Lump Sum*

On simple projects, the Lump Sum method reduces quantity overruns that might result from design errors. Contract administration costs associated with quantity verification and measurement are reduced.

#### *Project Types*

Lump Sum bidding is most effective on smaller, less complex projects with limited scope. Projects with a limited budget and need to reduce design time and/or management costs are especially suitable. Potential project types include resurfacing, rehabilitation, and maintenance projects.

#### *Design Considerations*

1. Lump Sum bidding requires that the design documents are clear and complete to provide the contractors with enough information to make an informed calculation.
2. Pre-bid meetings are mandatory for all projects using innovative bidding provisions.

#### *Award of Contract*

A contract using the Lump Sum bidding method is advertised as any other contract with the special status clearly explained. The contract is awarded in the standard way to the lowest qualified bidder.

#### *Construction Considerations*

A successful Lump Sum project is one that has open lines of communication between the contractor and inspector. Open communication can prevent problems occurring in the field, which can cause major time delays, financial losses, and claims. In order to ensure open lines of communication during construction, there are specific items that the Department can do. Some of these items are listed below:

1. Formal partnering is strongly encouraged when Lump Sum provisions are used on a project.
2. Regularly scheduled site meetings will ensure changes are readily addressed and accounted for and the schedule is kept up to date.
3. Any costs associated with changed, unforeseen, added or deleted work will be negotiated with the contractor using standard practices.
4. Inspection requirements and paperwork are reduced because the contractor assumes responsibility for quantities.

# *APPENDIX A*

# ***REFERENCES***

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***ECMS***

***ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM***

## ***INNOVATIVE BIDDING TOOLKIT***

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*PENNDOT*  
*Highway Administration*  
*[www.dot.state.pa.us](http://www.dot.state.pa.us)*

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1. Hancher, D.E., " Use of Warranties in Road Construction," NCHRP Synthesis of Highway Practices 195, Transportation Research Board, National Research Council, Washington D.C.:1994.
2. FHWA, "Contract Administration Core Curriculum Participants Manual and Reference Guide 2001."
3. Utah Technology Transfer Center, "Best Practices Guide for Innovative Contracting Procedures," Innovative Contracting Web Site, <http://www.ic.usu.edu/>, Logan, UT.
4. Kentucky Transportation Cabinet Division of Highway Design, Design Memorandum No. 5-98, <http://www.kytc.state.ky.us/design/memos/5-98.htm>.
5. Hancher, D.E., " Contracting Methods for Highway Construction," Transportation Research Board, National Research Council, Washington D.C.
6. Scott, S., "Contract Management Techinques for Improving Construction Quality," Report No. FHWA- RD-97-067, McLean, VA: July, 1997.
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8. Herbsman, Z., and C. R. Glagola., "Lane Rental-Innovative Way to Reduce Road Construction Time." Journal of Construction Engineering and Management. September/October, 1998: 411-417.
9. Trimels, K. A., Lane Rental in Wyoming. FHWA-Wyoming Division. Cheyenne, WY: March, 2000.
10. Federal Highway Administration. Technical Advisory Incentive/Disincentive for Early Completion (T 5080.10). USDOT: February, 1989. [www.fhwa.dot.gov/legsregs/directives/techadvs/t508010.htm](http://www.fhwa.dot.gov/legsregs/directives/techadvs/t508010.htm)
11. Glossary of Highway Quality Assurance Terms [www.nas.edu/trb/publications/ec010/ec010.pdf](http://www.nas.edu/trb/publications/ec010/ec010.pdf)
12. The Design Build Institute of America web site: [www.dbia.org](http://www.dbia.org)
13. Briefing on FHWA Innovative contracting practices:  
[www.fhwa.dot.gov/infrastructure/progadmin/contracts/sep\\_a.htm](http://www.fhwa.dot.gov/infrastructure/progadmin/contracts/sep_a.htm)
14. Techniques for Manually Estimating Road User Costa Associated with Construction Projects, Ginger Daniels, P.E., Texas Transportation Institute: <http://tti.tamu.edu/product/catalog/reports/407730.pdf>



# *APPENDIX B*

# **GLOSSARY OF TERMS**



**ECMS**

**ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM**

## **INNOVATIVE BIDDING TOOLKIT**

PENNDOT  
Highway Administration  
[www.dot.state.pa.us](http://www.dot.state.pa.us)

## **A** **A + Bx Bidding:**

Also known as Cost Plus Time Bidding. This contracting procedure allows for the time factor of a contract to be assigned a monetary value to evaluate the project on social and environmental impacts instead of only financial basis.

### **Agency Coordination:**

Refers to the process whereby PENNDOT contacts, consults and maintains communication with various public and environmental resource agencies, affording such agencies an opportunity to review and comment upon specific transportation proposals.

### **Agency Coordination Meeting (ACM)**

A monthly gathering of representatives from a number of resource agencies that review projects. The goal of ACM is to foster effective agency communications during the development of projects so environmental issues are identified, clearly understood and properly addressed early in the process. Project Team representatives present updates on the work to the ACM at several key stages of project development.

**Award**—The Department's written acceptance of a proposal.

## **B** **Bid Averaging\*:**

A contracting procedure in which the high and low bids are discarded, then the remaining bids are averaged with the contract being awarded to the contractor that comes closest to the average bid. The theory is that a contractor will submit a true and reasonable bid for a project and will be less likely to submit claims and to cut corners. To work well, sufficient (five or more) bidders must compete for the project.

### **Bidder:**

Any individual, firm, partnership, corporation or joint venture submitting a proposal for the work contemplated and acting either directly or through an authorized representative.

### **Bridge:**

A structure, including supports, spanning and providing passage over a waterway, a railroad, a highway or other obstruction; more than 6 m long, measured along the center of the roadway or railroad, between the faces of abutments. In the case of boxes or arches, the length is measured between the faces of the sidewalks and, in the case of multiple boxes, between the inside faces of the outside walls.

## **C** **Calendar Day:**

Every day shown on the standard calendar.

### **Completion Date:**

See Required Completion Date

### **Construction Phase:**

The fourth phase of the five-phase Transportation Project Development Process (encompassing Mitigation Follow-through), in which a Contractor selected by PENNDOT constructs the improvement alternative selected in the Design Phase. After a thorough final inspection, the new and / or improved transportation facility is opened for public use.

### **Consultant:**

An individual, firm or partnership with qualified expertise in engineering or environmental disciplines contracted by PENNDOT to provide technical services for design and study purposes.

*\*This contracting procedure is not discussed in this Toolkit.*

**Contract:**

The written agreement between PENNDOT and the Contractor for the construction of the project. The Contract includes the following: Proposal, Plans, Specifications, Agreement, Performance Bond, Payment Bond, Insurance Certificate, Notice to Proceed, all Work Orders and Supplemental Agreements required to complete the construction of the Project.

**Contract Item (pay item):**

A specifically described unit of work for which a price is provided in the Contract. Individual units in the component item schedule of a lump sum payment item are not considered contract items.

**Contractor:**

The individual, firm, partnership, corporation, or joint venture awarded the contract; acting directly through agents or employees, or the surety in case of default; or each participant in a joint venture.

**Constructability Review:**

Meetings held prior to bidding in which agency personnel from the relevant Design and Construction sections meet to evaluate proposed project design and develop a feasible construction schedule. They should also be used to investigate known project details and search for flaws in the contract as proposed that may prevent the project from going forward, and to begin to identify any potential utility, right-of-way, environmental and cultural issues.

**Cost Plus Time:**

See A+B Bidding.

**D****Deliverables:**

The completed end products of a consultant firm's scope of work. These may include Plans, Reports, Mapping, Graphics, Artwork Surveys, Statistical Data, Correspondence and other compiled information.

**Department:**

The Pennsylvania Department of Transportation (PENNDOT)

**Design Approval:**

An administrative action taken by PENNDOT at the conclusion of the Preliminary Engineering Phase to officially certify the route location and major design features of a highway. Design Approval is granted only after Environmental Clearance is obtained. Legal Notices are placed in local newspapers to advise interested parties of requests for and receipt of Design Approval. With Design Approval, a project is clear to advance to Final Design.

**Design/Build:**

A contracting procedure used to allow construction to begin before the entire set of contract plans are complete. The Design team and Construction team make up the Design /Build team, bid on the project as one Contractor and work on the project together until completion.

**Design/Build Modified Turnkey:**

A Design/Build project where the Department defines work limits, specifies the line and grade sections, provides the preliminary foundation design and conceptual design for bridges (including geotechnical data), obtains all permits, secures environmental clearances, clears all rights-of-way and arranges the utility relocations; and the Design/Build team completes the design and constructs the project based on the information received from the Department.

**Design/Build Request for Proposal:**

A formal document that describes the design and construction services required and provides interested contractors with sufficient information to enable them to prepare and submit proposals for evaluation and selection. Awards for an Request for Proposal are made to the responsible and responsive bidder whose proposal is determined to be the most advantageous to the Department.

**Design/Build Team:**

The project team made up of a Design firm and Contractor who work together on a Design/Build Project.

**Design Criteria:**

Established state and national standards and procedures guiding the establishment of roadway functional classification, layouts, alignments, geometry and dimensions for specified types of highways in certain defined conditions. The principal Design Criteria for highways are traffic volume, design speed, the physical characteristics of vehicles, the classification of vehicles and the percentage of various vehicle classification types using the highway.

**Designer:**

The District design squad or a design consultant under Contract with PENNDOT, responsible for providing design services.

**Design Manual:**

A six (6) volume series of publications describing PENNDOT's policies, procedures and design criteria for the evaluation, assessment, engineering design and development of highway and bridge projects. The Design Manual may be purchased through PENNDOT's Distribution Services Unit in Harrisburg, PA.

**Districts**

Geographic divisions of the Department for the purposes of management, design, construction, and maintenance.

**District Engineer**

The Engineer in charge of an engineering district of the Department.

**E Engineer**

Deputy Secretary for Highway Administration of the Department, acting directly or through an assistant or other representative, authorized by the Secretary or the Deputy Secretary for Highway Administration, with such assistant or other representative acting within the scope of the particular duties assigned or of the authority given.

**F Federal Aid Project:**

An activity, study, survey, project or other work related to transportation authorized in advance by the Federal Highway Administration (FHWA) and which is paid for either partially or fully by federal funds.

**Federal Highway Administration (FHWA):**

This agency oversees the process of planning, designing and constructing federally funded highway projects.

**Final Design Phase:**

A sub-phase of Design, the third (3rd) of the five (5) phases of the Transportation Project Development Process, involving the development of detailed working drawings, specifications and estimates for approved transportation projects. Final Design follows the receipt of necessary design and / or environmental approval and, it includes right-of-way acquisition, utility relocation and construction contract advertisement and award.

**G Guaranty:**

A guarantee to perform contracted activities in a specified way. A guarantee serving to assure a particular outcome or condition.

**I Impacts:**

Positive or negative effects upon the natural or human environment resulting from transportation projects.

**Incentive / Disincentive for Early Completion:**

A contracting procedure that awards the contractor a pre-determined amount per unit of time for early completion of the project or causes the contractor to pay a disincentive amount for late completion of the project.

**Inspector**

The Engineer's authorized representative assigned to make inspections of contract performance and of material furnished.

**Inspector-in-Charge:**

PENNDOT's authorized field representative in immediate charge of inspecting the performance of work on the construction project.

**J Job Order Contracting / Indefinite Quantity\*:**

A contracting method that allows for routine jobs to be completed at a faster pace.

**L Lane Rental:**

A contracting procedure used to charge a rental fee to the contractor for occupying a traveling lane to accomplish work on the project.

**Liquidated Damages \*:**

Contract provisions that provide a mechanism for the Department to recover these costs associated with the contract time overrun. The Department's cost for the administration of the contract, including engineering, inspection, and supervision, increases as the contract time increases. Road user costs also increase as the completion date of the contemplated facility is extended. The Department is required to incorporate liquidated damages provisions into its Federal-aid contracts as a condition of the project agreement.

**Low Bid :**

The lowest price offered by a bidding contractor based on the project's specifications. In an innovative bidding contract, low bid is generally combined with other contract specifications such as lane rental or warranties in awarding the contract.

**Lump Sum:**

A contracting procedure that lets the contract as one total price to accomplish the work.

**M Milestone Date:**

The date on which a specific portion of physical contract work is to be completed, prior to the Required Completion Date of all Contract work.

**Multi-parameter A + B + Q \*:**

Similar to A+B Bidding, this contracting procedure also places a monetary value on quality and evaluates the bids to determine the lowest bidder with due consideration given to quality of the project.

**N No Excuse Bonuses \*:**

The Department gives the contractor a "drop-dead date" for completion of a phase or project. If the work is completed in advance of this date, the contractor will receive a bonus. There are no excuses for any reason such as weather delays for not making the completion date (an exception might be made for catastrophic events such as hurricanes). There are no disincentives (other than normal liquidated damages) for not meeting the completion date. This technique has applicability to projects that must be open to meet a critical date such as a major sporting event.

**Notice to Proceed:**

Written notice to a consultant firm or a contractor stating the date to begin the work defined in a Contract or Agreement; includes Contract start-up date.

*\*This contracting procedure is not discussed in this Toolkit.*

## **O** Overall Value Rating

The value assigned to a proposal in the Request for Proposal process that indicates best value to the Department. The Overall Value Rating is determined by dividing the lump sum price in the cost proposal by the points awarded for the technical portion of the proposal assigned by the Technical Review Committee.

## **P** Partnering:

A formalized process set forth by carefully drafted language, whereby PENNDOT, contractors, subcontractors, utilities and third parties pledge to cooperate and work through job problems at the lowest level possible, maintaining open lines of communications.

### **PS&E Submission:**

The reference given to a transmittal of Plans, Specifications and Estimates made from a preparing office to PENNDOT for review and processing. This transmittal includes all written material and engineering data necessary to place a highway construction project under contract. These submissions are reviewed by PENNDOT for accuracy and completeness prior to bid. For certain major federal aid projects (non-exempt projects), the PS&E submission is also provided to the FHWA for final approval.

### **Permit:**

Written permission from a governmental agency to take certain action during the Transportation Project Development Process (relating to, for example, waterways or wetland encroachments, solid waste management, underground storage tanks, coastal areas, etc.)

### **Plans:**

The approved documents or drawings, or exact reproductions of them, for construction of the project. The plans show the location, character, dimensions, approximate quantities, and other details of the prescribed work, including layouts, profiles, and cross sections; plans also include cited Standard Drawings. However, subsurface soil and geological data (e.g. the Soil Survey Report and Profile and Core Borings) are excluded from this definition.

### **Pre-qualifications:**

The system for establishing a qualification rating, determining the maximum amount of Contract and one (1) or more of the classified types of work on which a Contractor will be eligible to bid or sub-contract, and the maximum amount the Contractor may have under Contract and incomplete at any one (1) time.

### **Price/Qualification Based \*:**

Awarding a contract on the basis of the highest composite score considering both price information and technical criteria. For instance, a composite score might be determined with a 50 percent weight for cost and 50 percent weight for technical qualifications of the contractor that are specific to those required by the project.

### **Project**

All of the work described in the contract.

### **Project Limits:**

The physical end points of a proposed project usually designated at geographic or municipal boundaries, inter-sections, roadway segments where cross-sections change or the beginning or end of numbered state traffic routes.

### **Project Manager:**

Originating Office staff member responsible for supervising the overall process of planning, developing and implementing one (1) or more phases of a given project.

### **Project Purpose:**

A broad statement of the overall intended objective to be achieved by a proposed transportation improvement.

**Proposal**

The offer of a bidder, on the proposal form, to construct the project, at the prices bid or predetermined.

**Proposal Forms**—The Department forms on which proposals are prepared and submitted for the work.

**Q****Quality:**

Preparing the design or products to meet criteria and expectations in an efficient, cost-effective manner using state-of-the-art engineering practices and good engineering judgment. Achieving quality is the responsibility of each individual performing the work.

**Quality Assurance (QA):**

The planned and systematic action performed by a party not involved in the Quality Control (QC) to provide adequate confidence that delegated approvals will comply with Federal and State requirements. It is the performance of a limited, high-level review of each product to confirm quality, economy and compliance with laws, regulations and policies prior to final acceptance by PENNDOT or prior to submission to external agencies for approval.

**Quality Control (QC):**

Processes performed by PENNDOT (and / or its consultants and contractors) ensuring delegated approvals comply with Federal and State requirements. QC is the responsibility of the party producing the product or service (which is PENNDOT in regard to the Exemption Agreement). For example, a document (calculations, drawings, reports, etc.) produced by a designer is thoroughly checked by another qualified person to ensure utilization of accepted logics, practices and correctness of all information (calculations, details, etc.)

**R****Required Completion Date:**

The date on which all physical contract work, including any authorized additional or extra work, is to be completed. The Required Completion Date is: (1) the date which follows the Notice to Proceed Date by the number of calendar days allowed for contract completion shown in the proposal plus any time extensions issued in writing by the Engineer less any time reductions issued in writing by the Engineer; or (2) the completion date shown in the contract plus any time extensions issued in writing by the Engineer less any time reductions issued in writing by the Engineer

**Right-of-Way:**

Land, property or interest therein acquired for and devoted to transportation purposes, including construction, maintenance, operations and protection of a facility.

**Road-User-Costs:**

Calculated daily cost to the traveling public resulting from construction work being performed. That cost primarily refers to lost time caused by conditions such as detours and rerouting that add to travel time, reduced roadway capacity that slows travel speed and increases travel time, and delays in the opening of a new or improved facility that prevents users from gaining travel time benefits.

**S****Scope of Work:**

A detailed, written listing of tasks prepared in advance of engineering and environmental work to explicitly define the contents of studies. A Scope of Work is typically provided to prospective consultant firms prior to the initiation of studies to aid them in preparing estimates of working hours, schedules and costs required to prepare, complete and deliver all portions of the work described.

**Scoping:**

As defined by the Council of Environmental Quality (CEQ) Regulations, the process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

**Special Provisions:**

Provisions, requirements or directions applying to the project, as set forth in the Proposal, and that are not contained in Publication 408M or its Supplements.

**Specifications:**

The compilation of technical provisions and requirements for the performance of prescribed work. PENNDOT's Standard Specifications are contained in Publication 408M.

**Staged Construction:**

The phasing of a construction project so only portions of the ultimate facility are built initially, which involves such practices as building two (2) lanes of highway on four (4) lanes of right-of-way, grading but not paving areas, constructing only portions of interchanges, or deferring permanent signing and lighting. The objective of stage construction is to maximize total benefits to the public from highway expenditures in a region or in a state.

**System Managers \*:**

A project delivery strategy in which all project design and interface functions are performed by a consultant under engineering and design services contracts, and all construction activities are performed by various contractors under different construction contracts. The responsibilities of a systems manager overlap both design and construction phases of the project and typically include development of project sequencing and coordination of the various subsystems, design, preparation of PS&Es, inspection, testing, and integration of the various subsystems into a total operating system.

**T Technical Proposal:**

A document submitted to PENNDOT to describe the means by which a consultant firm proposes to carry out a specific work assignment. Tasks, workload, schedules and documents to be produced are typically included therein.

**Technical Review Committee:**

The panel responsible for evaluating the Design/Build proposals in the Request for Proposal process. The membership may include a mix of federal, state, local or private sector engineers. The Technical Review Committee will be formed prior to and will participate in the development of the Scope of Work documents.

**W Warranties:**

A contracting procedure that guarantees the quality of specific services by the contractor for a pre-determined period of time.

*\*This contracting procedure is not discussed in this Toolkit.*



# *APPENDIX C*

## ***SAMPLE SPECIAL PROVISIONS***



***ECMS***

***ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM***

### ***INNOVATIVE BIDDING TOOLKIT***

*PENNDOT  
Highway Administration  
[www.dot.state.pa.us](http://www.dot.state.pa.us)*

## CMS NUMBER

### DESIGN/BUILD \*

045128  
097140  
112130  
062321

### A + B BIDDING \*\*

122089  
111531  
053154  
101117  
064243

### LANE RENTAL

103069  
124248

### INCENTIVE/DISINCENTIVE FOR EARLY COMPLETION

087346

### WARRANTIES \*\*\*

056141  
103115

\* **NOTE:** The Special Provision **should not** include the statement, " Submit to the Department, along with the bid, the name and address of the contractor's design consultant including the firm's resume showing the experience....."

\*\* **NOTE:** The Special Provision **must** stipulate the use of a "+" days to complete work to be compatible with ECMS. The use of a "-" to indicate the days sooner than the Department's completion date will not be accepted by ECMS.

\*\*\* **NOTE:** Draft Provisional Special Provisions for Bituminous Concrete Pavement, 60-Month Warranty is under review.

# *APPENDIX D*

## ***REPORTS FROM OUTSIDE SOURCES***



***ECMS***

***ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM***

### ***INNOVATIVE BIDDING TOOLKIT***

*PENNDOT  
Highway Administration  
[www.dot.state.pa.us](http://www.dot.state.pa.us)*

A Method to Determine Minimum Contract Time for Highway Projects:

A quantifying model to determine a reasonable minimum limit of contract time for SHAs, using projects from the Florida DOT to illustrate this model - **Jin-Fang Shr, Benjamin P. Thompson, Jeffrey S. Russell, and Bin Ran**, University of Wisconsin – Madison, Department of Civil and Environmental Engineering, Room 2304, 1415 Engineering Dr., Madison, WI 53706, Tel: 608-262-7244, Fax: 608-265-9860, [russell@engr.wisc.edu](mailto:russell@engr.wisc.edu).

Associated General Contractors organization, index to design build documents - [www.agc.org/Marketplace/contract\\_documentsii.asp#DESIGNB](http://www.agc.org/Marketplace/contract_documentsii.asp#DESIGNB)

American Council of Engineering Companies *Multiple Project Delivery Systems: The Design Professional's Handbook on Design/Build Project Delivery* Ben Perez, Editor  
Analyzes the important risks, steps, and milestones for firms considering and performing design-build projects - <http://www.acec.org/shoppingcart/main.asp>

FHWA Summary Report of the Contract Administration Techniques for Quality Enhancement Study Tour (CATQUEST) June 1994 – <http://ntl.bts.gov/DOCS/catquest.html>

Archive of articles pertaining to design/build projects from Design Build Magazine - <http://www.designbuildmag.com/archive.asp>

FHWA's Contract Administration Home Page (with information on SEP-14) - <http://www.fhwa.dot.gov/infrastructure/progadmin/contracts/hng22.htm>

Techniques for Manually Estimating Road User Costs Associated with Construction Projects: (Texas Transportation Institute) <http://tti.tamu.edu/product/catalog/reports/407730.pdf>

FHWA Technical Advisories <http://www.fhwa.dot.gov/legregs/directives/techadv.htm>  
T5080.10      2/8/89      Incentive/Disincentive (I/D) for Early Completion  
T5080.15      10/11/91      Construction Contract Time Determination Procedures

Work Plan Requirements – Special Experimental Project No. 14 (SEP-14) Innovative Contracting Practices - [http://wwwcf.fhwa.dot.gov/programadmin/contracts/wkpl\\_req.htm](http://wwwcf.fhwa.dot.gov/programadmin/contracts/wkpl_req.htm)

AASHTO Subcommittee on Construction, Primer on Contracting 2000  
(available from the Bookstore at [www.transportation.org](http://www.transportation.org).)

Prerequisites for a Successful Design/Build Highway Construction Contract - <http://wwwcf.fhwa.dot.gov/programadmin/contracts/byrd.htm>

FHWA SEP-14 Design/Build Information - [http://wwwcf.fhwa.dot.gov/programadmin/contracts/d\\_build.htm](http://wwwcf.fhwa.dot.gov/programadmin/contracts/d_build.htm)

ACEC Model State Design/Build Legislation - <http://www.acec.org/programs/dblong.htm>

Maine DOT Report on Constructibility Review - <http://wwwcf.fhwa.dot.gov/programadmin/contracts/maine.htm>  
Florida DOT's "No Excuse Bonus" Payment and Waiver of Contractor Claims -

# APPENDIX D

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<http://www.dot.state.fl.us/specificationsoffice/Jan2002WB/d0080016.pdf>

Florida DOT Definitions in Lane Rental Clause -

<http://www.dot.state.fl.us/specificationsoffice/Jan2002WB/d00200lr.pdf>

Colorado DOT Design Support - Innovative Contracting Procedures -

<http://www.dot.state.co.us/developprojects/designsupport/construction/1999innov.htm>

# ***SAMPLE CASE STUDIES***

[illegible]

## ENGINEERING & CONSTRUCTION MANAGEMENT SYSTEM

**PENNDOT**  
Highway Administration  
[www.dot.state.pa.us](http://www.dot.state.pa.us)

# APPENDIX E

## Innovative Contracting Case Studies



District

County

Project Name

### Project Description

This project included breaking and seating of 5.76 miles of existing concrete pavement and constructing a heavy bituminous overlay. The existing roadway is a four-lane divided arterial constructed in 1970 with 10" RCCP. Because of the late start date an incentive was added to stimulate the contractor to complete as much work in the 2000 season as possible.

### Innovative Contracting Techniques Used (check all that apply):

- ☐ A+B ☐ Lane Rental
- ☒ Design/Build ☐ Lump Sum
- ☒ Incentive/Disincentive ☐ Warranty

Other

### Contract Amount

Original	Final
\$15,647,600	\$15,744,600

### Completion Date

Original	Final
10/16/01	10/16/01

### What Worked?

Good communication between designers, contractors and PENNDOT personnel. The contractor was able to complete 1.6 miles of the project in the 2000 season.

### What Didn't Work?

A vague scope of work. The bid/build process was rushed and did not allow adequate time for development of a detailed scope of work and pre-bid activities. Too much "mind reading" or assumptions that the project scope and project objectives were understood by all involved.

### Any Industry Reaction?

No Industry reactions identified.

### Lessons Learned

Include a stipend for bidders that have up front costs before low bid award. Develop an accurate and detailed scope of work with measurable criteria. Facilitate better cooperation between field inspectors and foreman.

### Overall Review

Prime contractor – Mostly Good  
Project  
PENNDOT ACE –Positive results achieved  
PENNDOT Project Engineer –Key actor in keeping project on track and successful completion.

Evaluation Completed: Yes  
Type of Evaluation: SEP 14  
Evaluation on file at: 1-0

### Recommendations for Further Use

Design/Build Task Force should develop guidelines for use by District Offices. Should provide longer time period to complete pre-bid activities. Design/Build process is appropriate to less complex projects with fewer alternatives to consider.

Contact Person

Phone Number

# APPENDIX E

## Innovative Contracting Case Studies



District

County

Project Name

### Project Description

Design and construction for the replacement of the existing bridge carrying SR 0706 over Wyalusing Creek, immediately adjacent (downstream) to existing bridge. The project also involves the design and construction of approximately 2000 feet of roadway approach work, drainage, guide rail improvements and improvements to the intersection of SR 0706 and SR 0858.

### Innovative Contracting Techniques Used (check all that apply):

- |                                                  |                                      |
|--------------------------------------------------|--------------------------------------|
| <input type="checkbox"/> A+B                     | <input type="checkbox"/> Lane Rental |
| <input checked="" type="checkbox"/> Design/Build | <input type="checkbox"/> Lump Sum    |
| <input type="checkbox"/> Incentive/Disincentive  | <input type="checkbox"/> Warranty    |

Other

### Contract Amount

Original	Final
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### Completion Date

Original	Final
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### What Worked?

The contractor's performance was "Good". There were no claims on the project and few work orders.

### What Didn't Work?

The process still requires a rather complete preliminary package. The Department has to complete the time consuming preliminary design including right-of-way and environmental clearance. The roadway design was nearly complete because of the Right-of-Way, Utilities, Environmental and other improvements. The contractor just "Stamped" the Department's right-of-way plan. On this project it may have been better to exclude the design of the roadway because the Department did most of the design to obtain the necessary permits.

### Any Industry Reaction?

Unsuccessful bidders were not able to recoup charges from designers to work up a list of items and quantities to be included in the project. This fact may preclude some contractors from bidding on Design/Build projects in the future.

### Lessons Learned

The Design/Build process may be best suited for larger structures.

### Overall Review

Good to Very Good

Evaluation Completed: Yes  
Type of Evaluation: SEP 14  
Evaluation on file at: 4-0

### Recommendations for Further Use

Review what other States have encountered in Design/Build and how they have resolved problems that could be applied to Department projects. Continued use of Design/Build because of the time savings.

Contact Person

Phone Number



# APPENDIX E

## Innovative Contracting Case Studies



<b>District</b>	10-0	<b>Project Name</b>	103069 SR 80, Section 346	<b>Project Description</b>	Restoration of I-80 from SR 68 East to SR 322 Clarion Township
<b>County</b>	Clarion				

### Innovative Contracting Techniques Used (check all that apply):

- |                                                            |                                                 |
|------------------------------------------------------------|-------------------------------------------------|
| <input type="checkbox"/> A+B                               | <input checked="" type="checkbox"/> Lane Rental |
| <input type="checkbox"/> Design/Build                      | <input type="checkbox"/> Lump Sum               |
| <input checked="" type="checkbox"/> Incentive/Disincentive | <input type="checkbox"/> Warranty               |

Other

### Contract Amount

Original

\$5,890,000

Final

\$5,890,000

### Completion Date

Original

4/20/00

Final

4/20/00

### What Worked?

Lane rental concept worked well on this preventative maintenance project. The use of a well-planned CPM schedule was critical to the success of this project. The CPM schedule was completed with realistic production rates. Ride quality specifications with incentive/disincentive clauses were used to offset any potential quality reduction due to accelerated speed at which work is actually completed.

### What Didn't Work?

No identified problems. Safety may be an issue on some projects because the potential for more accidents could occur since the crews normally work longer hours with increased chance for physical and mental fatigue. Typically the crews worked 6 days, 14 hours per day; however, overall exposure time is less as operations are planned more efficiently.

### Any Industry Reaction?

No identified industry reaction.

### Lessons Learned

Pre-determined rental amounts per day-based on road user costs- were used in this contract. Future contracts may have hourly rental amounts based on feedback from the contractors involved with lane rental projects to-date.

### Overall Review

The District will continue to selectively specify lane rental items on additional PM projects.

Evaluation Completed: No  
Type of Evaluation:  
Evaluation on file at:

### Recommendations for Further Use

Preventative Maintenance (PM) projects are the best type of project to utilize lane rental clauses or provisions. Projects which have the highh potential for unforeseen delays, such as new or reconstruction projects, could result in delay claim-related issues.

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